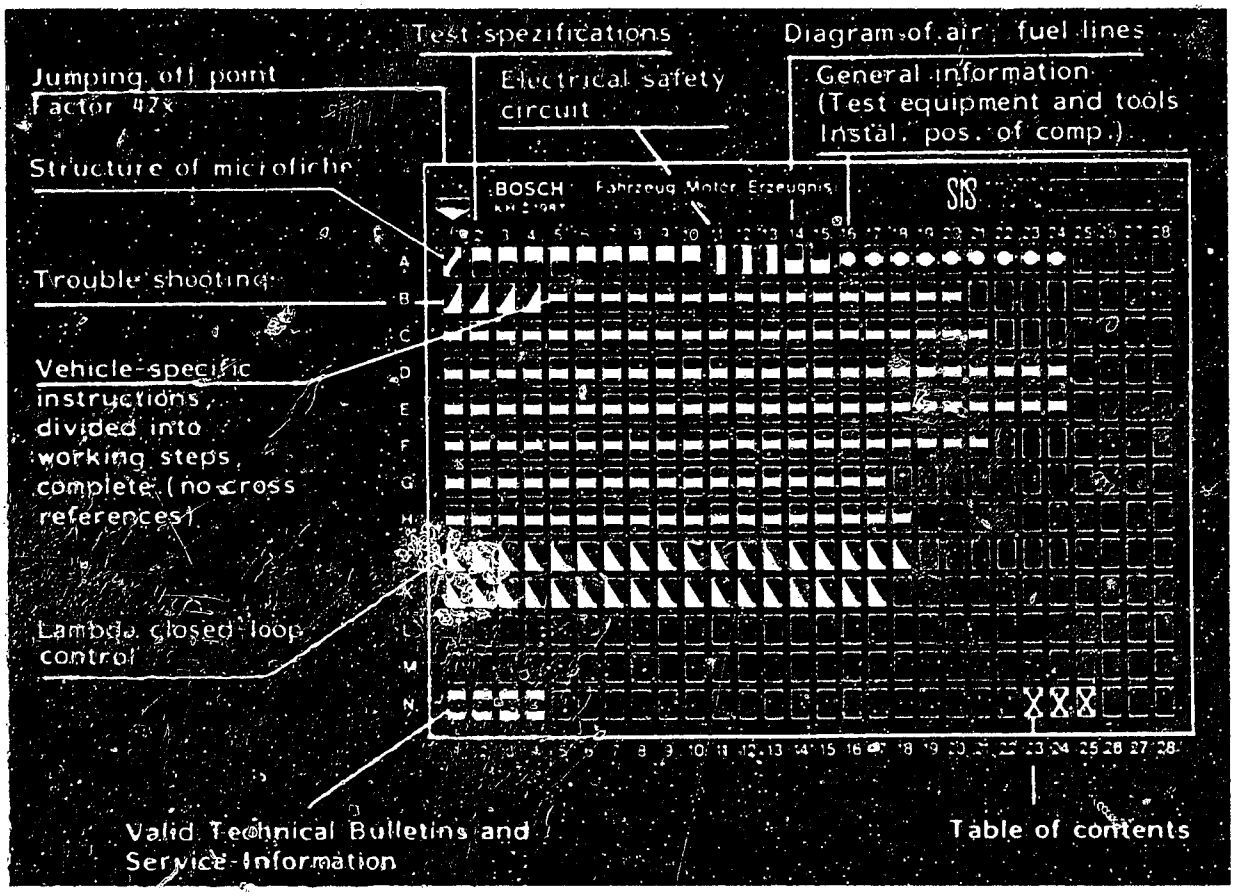
Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section

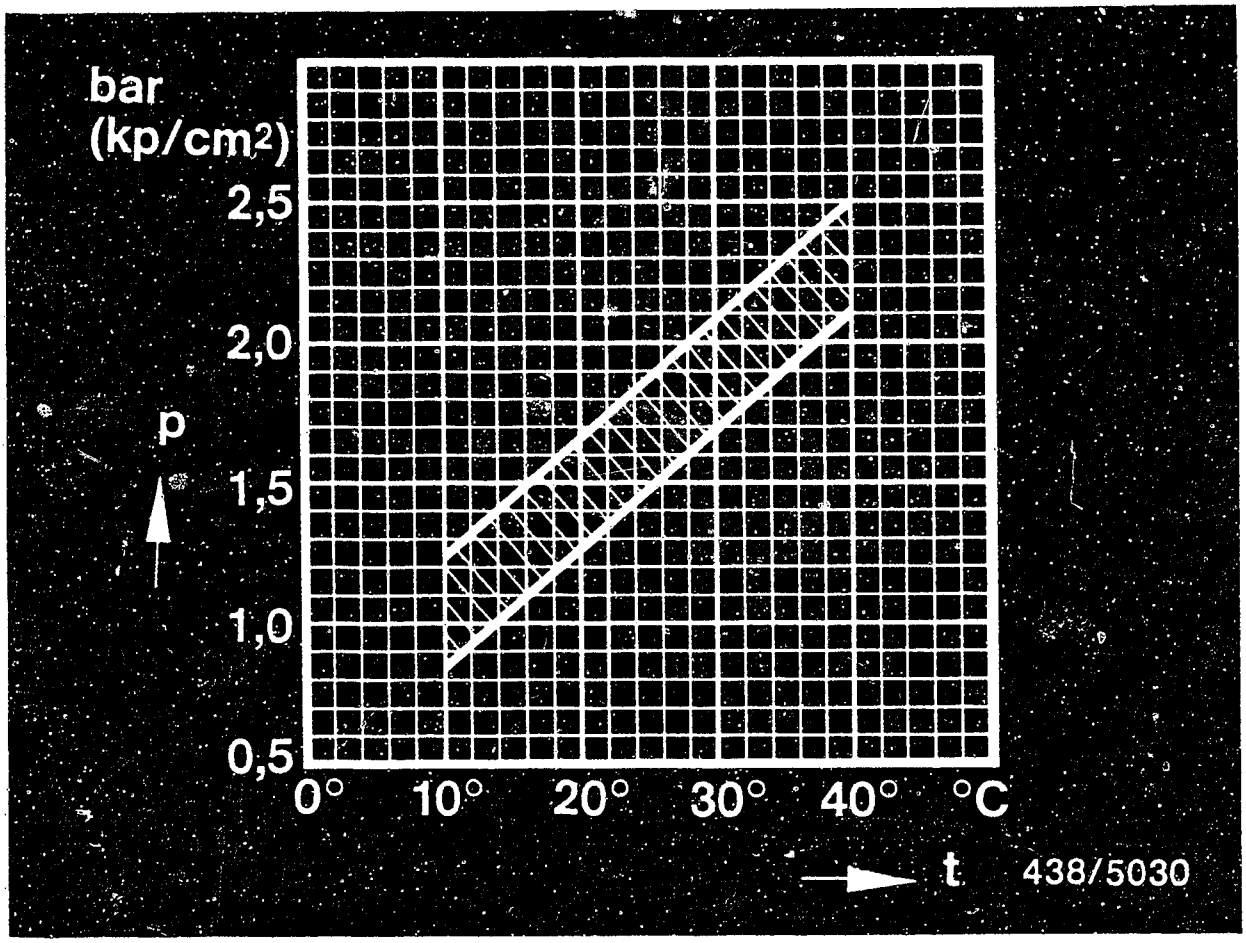
Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1 Trouble-shooting chart



p = Control pressure (overpressure)
t = Ambient temperature

D1

1. TEST SPECIFICATIONS

1.1 Control pressure "cold"

Part no. of warm-up regulator:

0 438 140 020 - Basic version, without additional functions, for model 78 with and without lambda closed-loop control

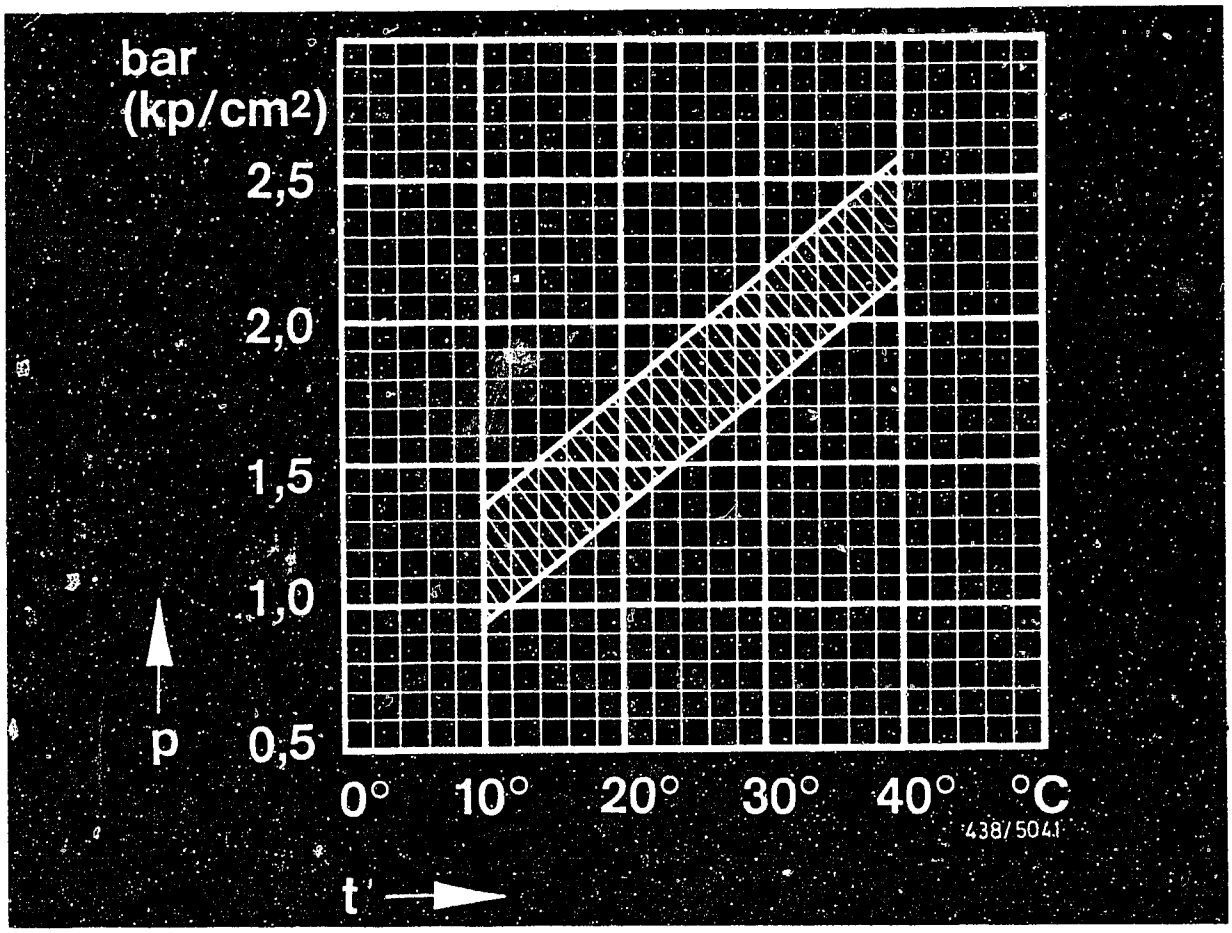
0 438 140 070 - for mod.80 Eur., wtht. lam. cl.-l. con.
0 438 140 085 - for mod.81 Eur., wtht. lam. cl.-l. con.
0 438 140 102 - from mod.82 Eur., wtht. lam. cl.-l. co.

Versions for charge-air-pressure-dependent full-load enrichment

Test without intake-manifold pressure.

Determine desired control pressure "cold" from graph according to ambient temperature.

Pressures in the test specifications are given in bar and in kgf/cm^2 (overpressure)



p = Control pressure (overpressure)
t = Ambient temperature

D1

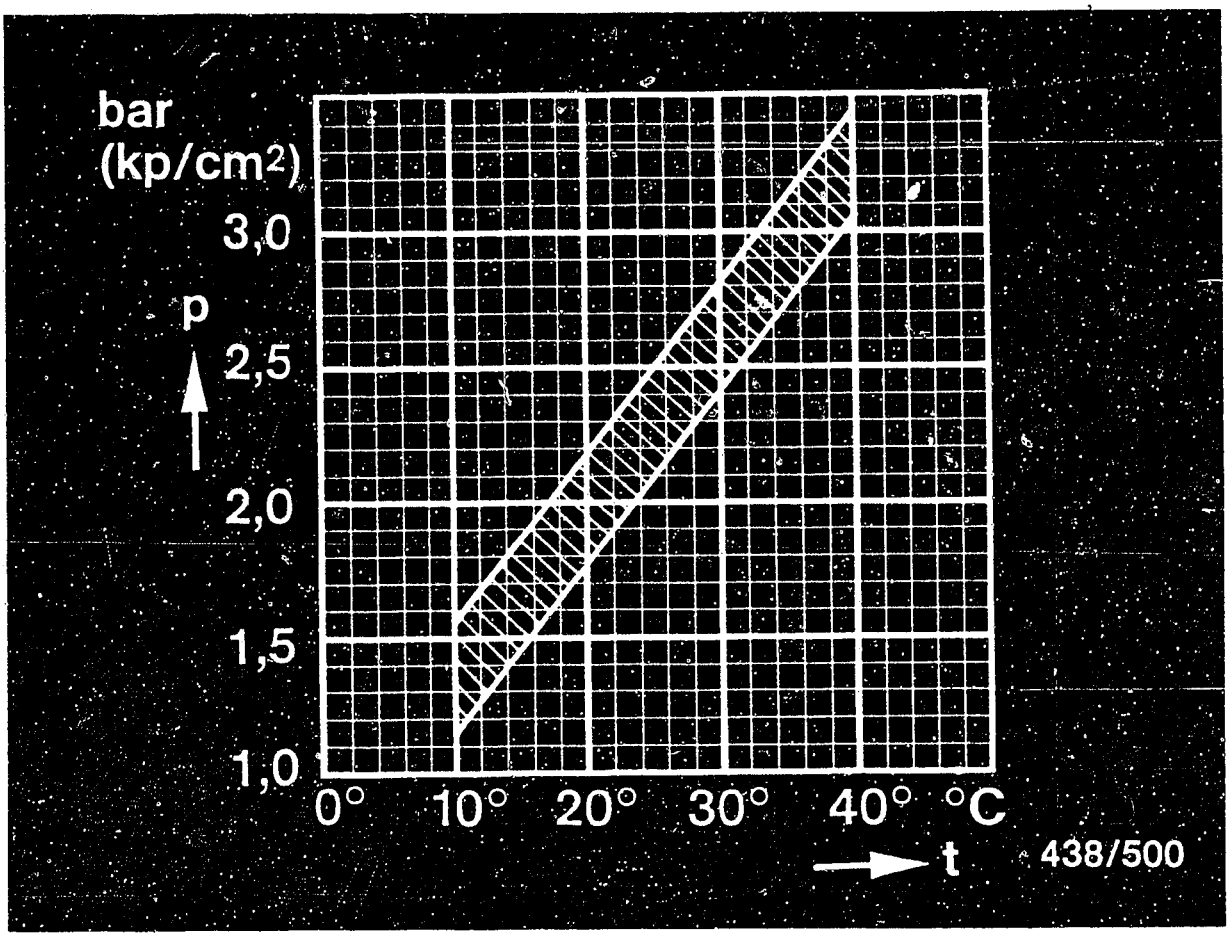
Control pressure "cold" (continued)

Part no. of warm-up regulator:
0 438 140 051 - Mod.79, with lambda cl.-l. con. (USA)

Basic version, without additional functions.

Determine desired control pressure "cold" from graph according to ambient temperature.

Pressures in the test specifications are given in bar and in kgf/cm^2 (overpressure)



p = Control pressure
t = Ambient temperature

D1

Control pressure "cold" (continued)

Part no. of warm-up regulator:
0 438 140 084 - for mod.81, with lam. cl.-l. con. (USA)
0 438 140 136 - from mod.82, with lam. cl.-l. con.
(USA, from 5.85 also D, CH)

Determine desired control pressure "cold" from graph according to ambient temperature.

Pressures in the test specifications are given in bar and in kgf/cm^2 (overpressure)

1.2 Control pressure "warm"

Part no. of warm-up regulator: 0 438 140 020 (model 78 with and without lambda cl.-l. con.	3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm^2)
0 438 140 084 (model 80 with lambda cl.-l. con. (USA) 0 438 140 136 (from model 81 with lam. cl.-l. con. (USA, from 5.85 also D, CH)	3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm^2)

---

0 438 140 070 (model 80) 0 438 140 085 (model 81) 0 438 140 102 (from model 82) (Versions for charge-air- pres.-dep. full-load enrichment, without lam. cl.-l. con.)	
* Test wtht. char.-air pres.:	3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm^2)
* Test with simulated charge- air pressure (overpressure) 650 ... 750 mbar:	2.4 ... 2.8 bar (2.5 ... 2.9 kgf/cm^2)
* Leak test on full-load diaphragm:	
Test pressure:	650 mbar
max. pressure drop:	100 mbar/15 s

1.3 Electric fuel pump

Fuel delivery:	min. 950 cm^3/30 s

Pressures in the test specifications are given in bar and in kgf/cm^2 (overpressure)

E1

1.4 Primary pressure:

Part no. of fuel distributor:

0 438 100 045	
0 438 100 057	
Checking value:	5.2 ... 5.8 bar (5.3 ... 5.9 kgf/cm^2)
Setting value:	5.4 ... 5.6 bar (5.5 ... 5.7 kgf/cm^2)
0 438 100 058	
Checking value:	4.7 ... 5.4 bar (4.8 ... 5.9 kgf/cm^2)
Setting value:	4.9 ... 5.1 bar (5.0 ... 5.0 kgf/cm^2)

E9

1.5 Leak test (complete system)

Minimum pressure after 10 minutes with fuel accumulator:	
0 438 170 014 (model 78):	1.6 bar (1.7 kgf/cm^2)
0 438 170 010 (model 79/80):	2.0 bar (2.1 kgf/cm^2)
0 438 170 030, ...047 (from model 81):	2.5 bar (2.6 kgf/cm^2)
Minimum pressure after 20 minutes with fuel accumulator:	
0 438 170 014	1.4 bar (1.5 kgf/cm^2)
0 438 170 010	1.7 bar (1.8 kgf/cm^2)
0 438 170 030, ...047	2.4 bar (2.5 kgf/cm^2)

Pressures in the test specifications are given in bar and in kgf/cm^2 (overpressure)

1.6 Injection valves

Opening pressure for part no.:	
0 437 502 004	
up to FD 828 (model 78)	2.5 ... 3.6 bar (2.6 ... 3.7 kgf/cm^2)
from FD 829 (model 79)	2.7 ... 3.8 bar (2.8 ... 3.9 kgf/cm^2)
0 437 502 012 (from mod. 80)	3.0 ... 4.1 bar (3.1 ... 4.2 kgf/cm^2)

Pressures in the test specifications are given in bar and in kgf/cm^2 (overpressure)

1.7 Fuel distributor

Comparative measurement of fuel deliveries

Part no. of fuel distributor: 0 438 100 045
0 438 100 057
Versions without lambda closed-loop control

0 438 100 032
Version for lambda closed-loop control, model 78/79

	Setting point $cm^3/min.$	max. allowable delivery $cm^3/min.$
Idle	6.0	6.8
Part load	40.0	44.0
Full load	160.0	175.0

Part no. of fuel distributor: 0 438 100 058
Version for lambda closed-loop control, from model 80

	Setting point $cm^3/min.$	max. allowable delivery $cm^3/min.$
Idle	6.0	6.7
Part load	40.0	43.0
Full load	150.0	164.0

1.7 Fuel distributor (continued)

Notes:

* Fuel distributors ... 032 and ... 058 are versions for lambda closed-loop control. Note the following when testing:

Fuel distributor ... 032:	Test without func. of timing valve, i.e. cable connector pulled out.
Fuel distributor ... 058:	Test "timed", i.e. timing valve connected and functioning.

* Applies to all fuel-distributor versions:
At least the full-load setting given in the above tables must be achieved at each outlet.

1.8 Idle adjustment

1.8.1 Models without lambda closed-loop control:

Idle speed: 800 ... 900 min^{-1}

Exhaust-gas adjustment

- CO concentration:
  - General, up to model 81: 0.5...2.5% by vol.
  - Sweden ver. up to model 81: 1.0...2.0% by vol.
  - All versions from model 82: 0.2...1.0% by vol.

1.8.2 Models with lambda closed-loop control:

Idle speed:

- up to model 80: 825...875 min^{-1}
- from model 81: 800...950 min^{-1}

Exhaust-gas adjustment: Do not test and adjust by CO measurement, but by measuring the on/off ratios of the lambda closed-loop control system.

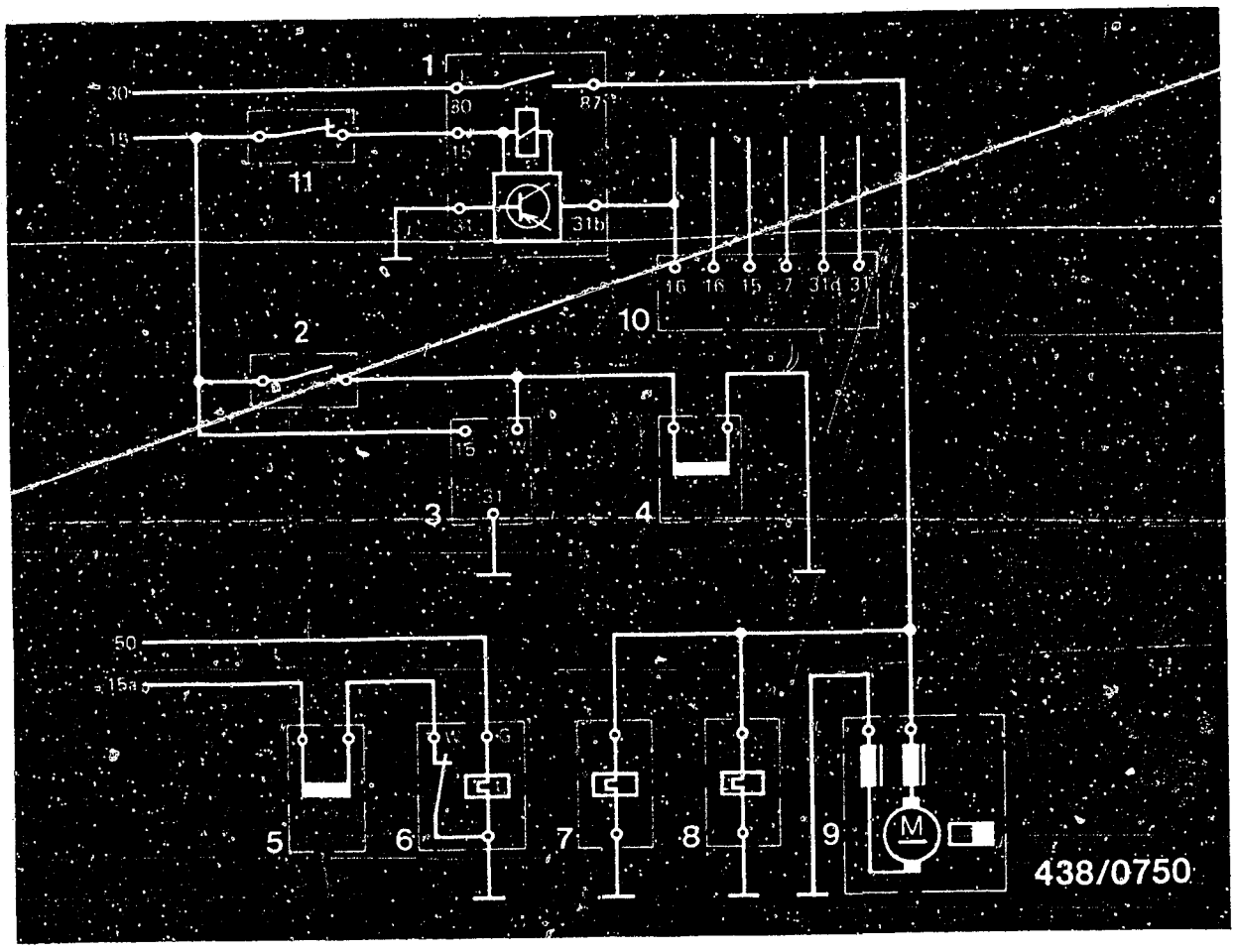
On/off-ratio checking value: 20...80% (limit value)

setting value:

- up to model 81: 55...65%
- from model 82: 45...55%

1.9 Lambda closed-loop control - on/off ratios:

	Part no. of control unit 0280800035 --> M 81	0280800054 M 82/83	0280800070 M 84 -->
t_0 (min.)	max. 20%	max. 20%	max. 20%
t_1 (control)	55 ... 65%	45 ... 55%	45 ... 55%
t_2 (max.)	min. 87%	min. 87%	min. 90%
t_3 (full load)	80 ... 90%	70 ... 80%	80 ... 90%
t_4 (oil temp.)	- -	55 ... 65%	55 ... 65%
t_5 (accel.)	- -	- -	min. 90%



2. ELECTRICAL SAFETY CIRCUIT
(without lambda closed-loop control)

2.1 Circuit diagram

1 = Electronic engine-speed relay
2 = Throttle-valve microswitch
3 = Speed sensor
4 = Solenoid-operated valve for full-load enrichment
5 = Start valve
6 = Thermo-time switch
7 = Auxiliary-air device
8 = Warm-up regulator
9 = Electric fuel pump
10 = Ignition trigger box
11 = Charge-air-pressure switch

Note:

See Coordinates J9/J10 for terminal diagram of models with lambda closed-loop control.

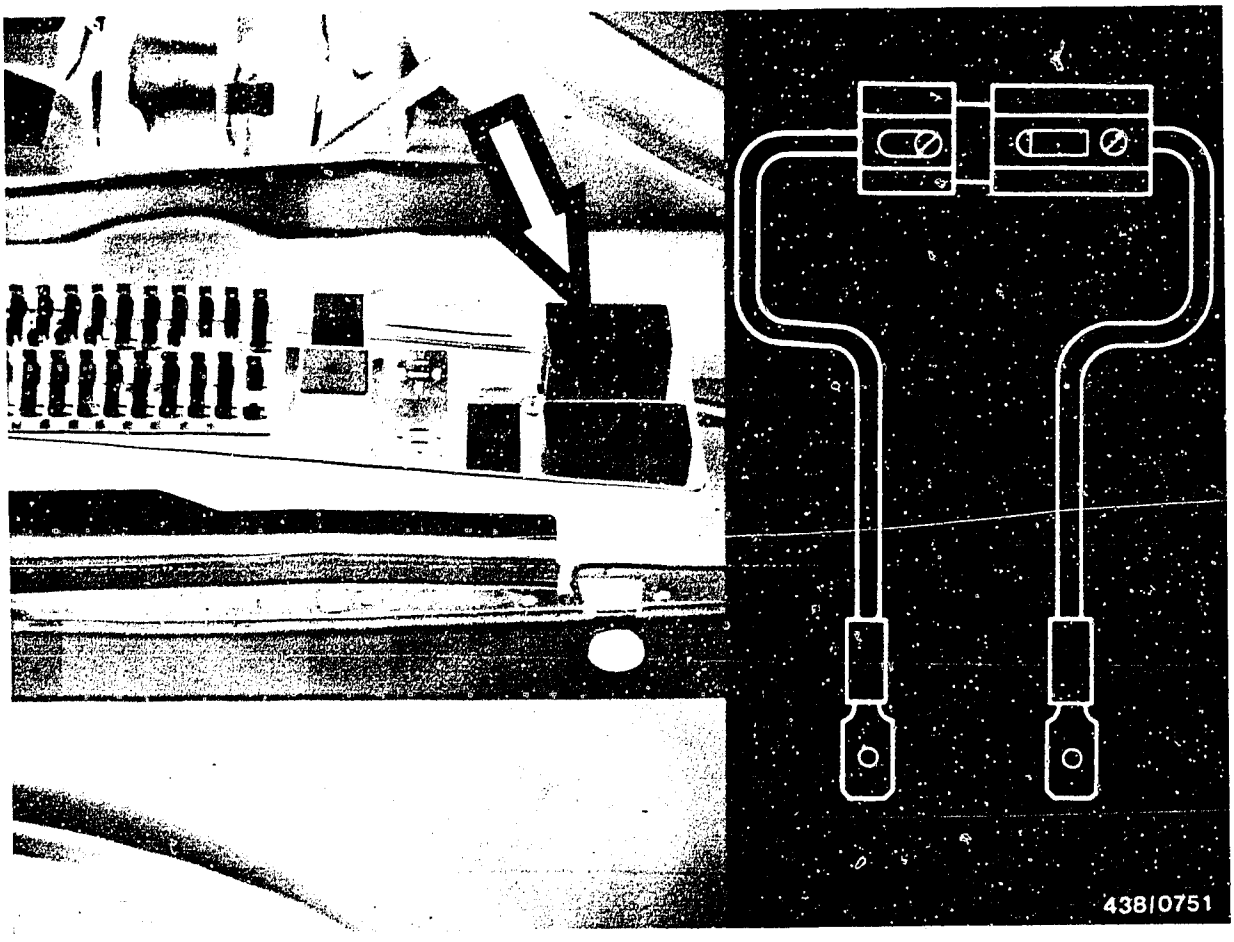
Engine-speed monitoring/overload protection

In order to monitor the charge-air pressure on all models, a pressure switch is connected on the intake manifold. If the charge-air pressure is too high (e.g. if there is a defect on the wastegate), this pressure switch cuts the power supply to the relay of the electrical safety circuit and thus cuts the power supply to the electric fuel pump.

The electronic relay of the safety circuit also serves as an engine-speed limiter.

Cut-in speed: approx. 30 min^{-1}

Cut-out speed: 5900 ... 6200 min^{-1}

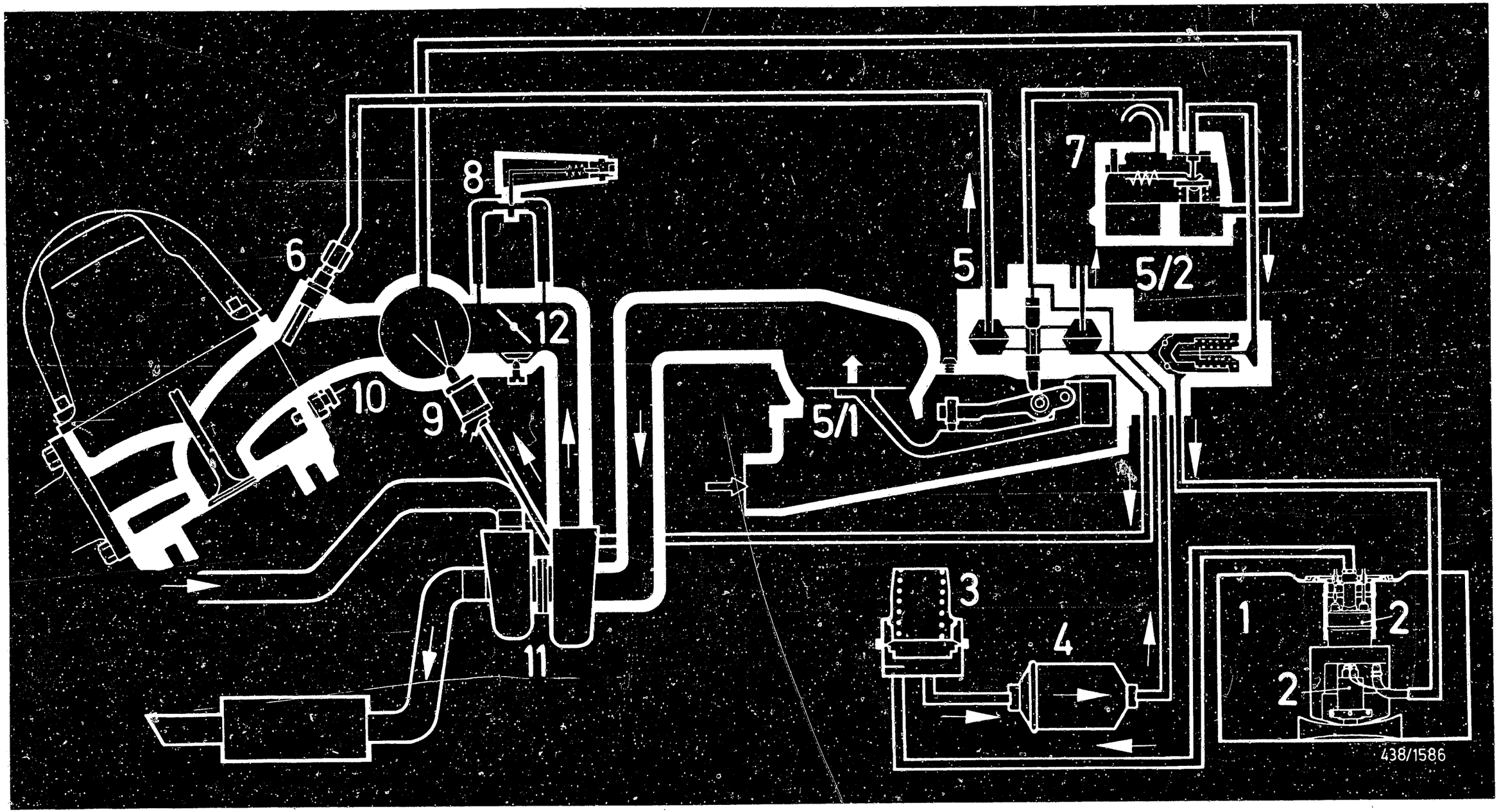


2.2 Bridging the safety circuit

In order to carry out testing with the engine stationary, it is necessary to bridge the safety circuit. To do this, pull the electronic relay (arrow) out of the central-electrics console (above right-hand wheel box on 99-Turbo, above left-hand wheel box on 900-Turbo). Using a jumper lead, bridge contacts 30 and 87 in the console.

Equip the jumper lead with a fuse holder and 16 A fuse.

Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.



3. DIAGRAM OF AIR/FUEL LINES (without lambda closed-loop control)
(for version with lambda closed-loop control, see coordinates J11/J12)

1 = Fuel tank
2 = Electric fuel pump (As of model 84, with additional pre-supply pump)
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Injection valve(s)
7 = Warm-up regulator
8 = Auxiliary-air device
9 = Start valve
10 = Thermo-time switch
11 = Turbocharger
12 = Throttle valve

A14 Diagram of air/fuel lines — Saab 99/900-Turbo →

A15 Diagram of air/fuel lines — Saab 99/900-Turbo ←

4. GENERAL INFORMATION

4.1 Introduction

This repair manual refers to the vehicle type

SAAB 99/900 Turbo as from the 1978 model.

All models are covered, both with and without lambda closed-loop control. The versions with lambda closed-loop control were supplied from the start of the series in the USA, but also in some European countries as an option from 5.85.

All the components of the K-Jetronic are dealt with in separate working steps with the corresponding test specifications. All testing and repair information for the additional lambda system is given in summary form from Line J.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - one should have a clear understanding of the K-Jetronic. The essential points of the operation and construction of the K-Jetronic, also with lambda closed-loop control, are described in Technical Instruction 2009.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.
The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test programme for each fault.
The trouble-shooting chart on Coordinates B1-B4 is intended to make it easier to decide which test steps have to be carried out for certain faults.
According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinates at the end of the cause column refer to the appropriate test step with the associated test specification.

Important note:
If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.
Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

4.2 Version of K-Jetronic, models without lambda closed-loop control

(for models with lambda cl.-l. control, see Line J.)

The entire system of the K-Jetronic in the Saab Turbo corresponds to the basic version as described in Technical Instruction.

The following components are different:

4-cylinder fuel distributor in 6-cylinder version due to large fuel deliveries (2 outlets sealed off).

- Auxiliary device for full-load enrichment on the 1978/1979 model.

- Warm-up regulator in version for charge-air-pressure-dependent full-load enrichment on the 1980/1981 model. Application of intake-manifold pressure through special control system.

- Engine-speed monitoring through electronic engine-speed relay and charge-air pressure monitoring through charge-air-pressure switch.

4.3 Additional equipment for mixture preparation and emission control:

- Throttle-valve closing damper for delaying the closing of the throttle valve.

- Time-delay valve for intake-manifold-pressure-dependent timing advance of the ignition distributor on the Sweden model.

- Exhaust-gas recirculation on the Sweden model.

These additional components/additional equipment must be borne in mind when trouble-shooting. It is, therefore, important to know how they work and what possible influence they have on the running of the engine. A detailed description is therefore contained in a special section on Coordinates H 1 to H 18.

The testing of the various full-load enrichment systems is described in the corresponding sections.

5. TEST EQUIPMENT AND TOOLS

- Pressure tester KDJE-P 100 (previously KDEP 1034).
  For testing all fuel pressures and testing for leaks.

- Adjusting wrench KDEP 1035.
  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)
  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).
  For comparing the fuel delivered from the individual fuel-distributor outlets.

- Graduate (commercially available, capacity approx. 1.5 l)
  For measuring the delivery of the electric fuel pump.

- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor

  (1981 model): e.g. No. 4521/7 from the Hazet company, D-5630 Remscheid.
  (Also suitable for the aluminium anti-tamper device of the USA models).

- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

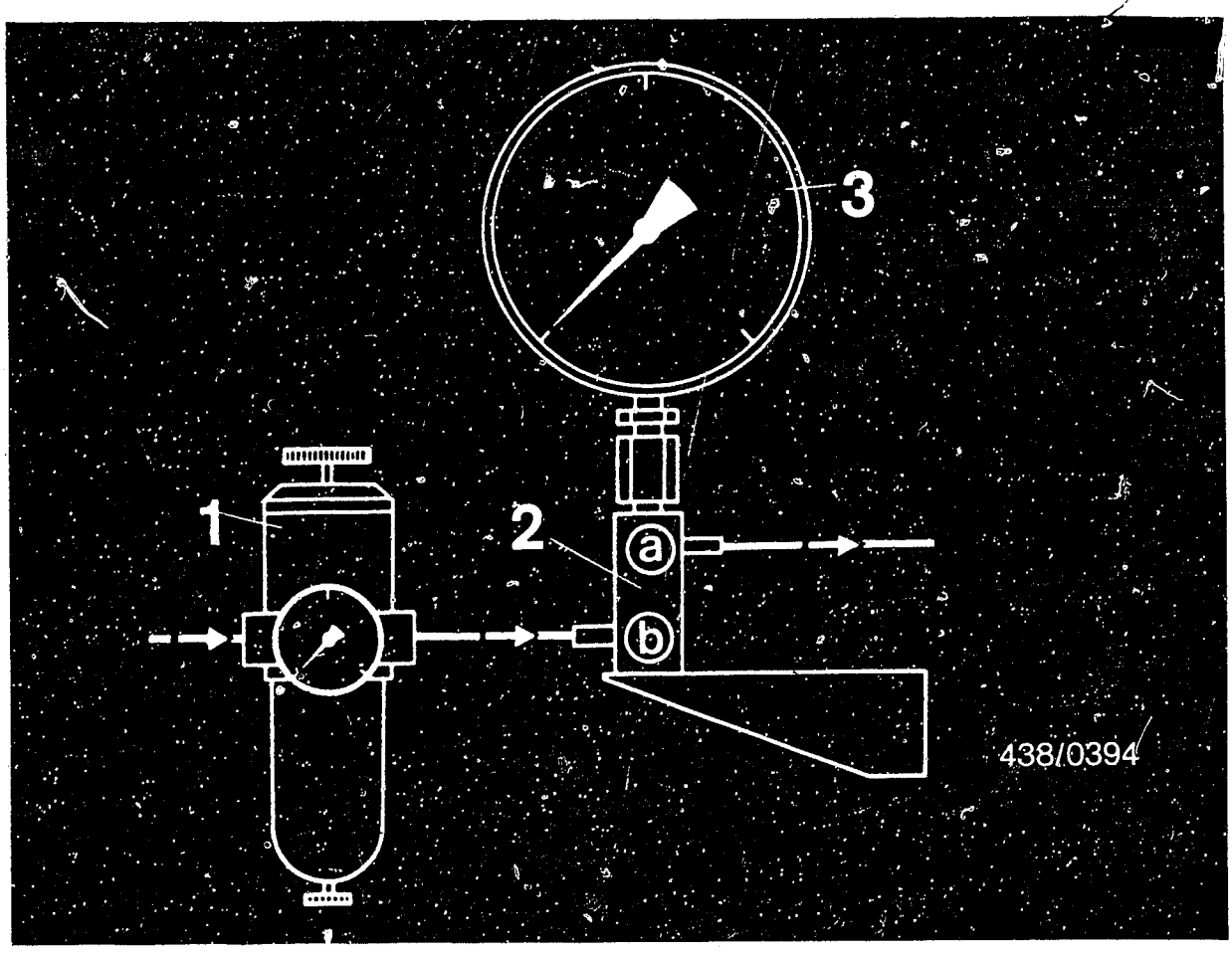
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
Bosch, Part Designation VS 14 942-CH
previously Part No. 5 973 340 650
The Bosch calibrating fliud can be obtained in 5 1 metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)
  For idle-speed adjustment

- CO meter (commercially available)
  For idle-speed CO adjustment.

- On/off-ratio meter for lambda closed-loop control (e.g. BOSCH lambda-closed-loop-control tester KDJE-P 600 or BOSCH motortester, e.g. MOT 300/400).



- Charge-air pressure measuring and adjusting device, comprising:

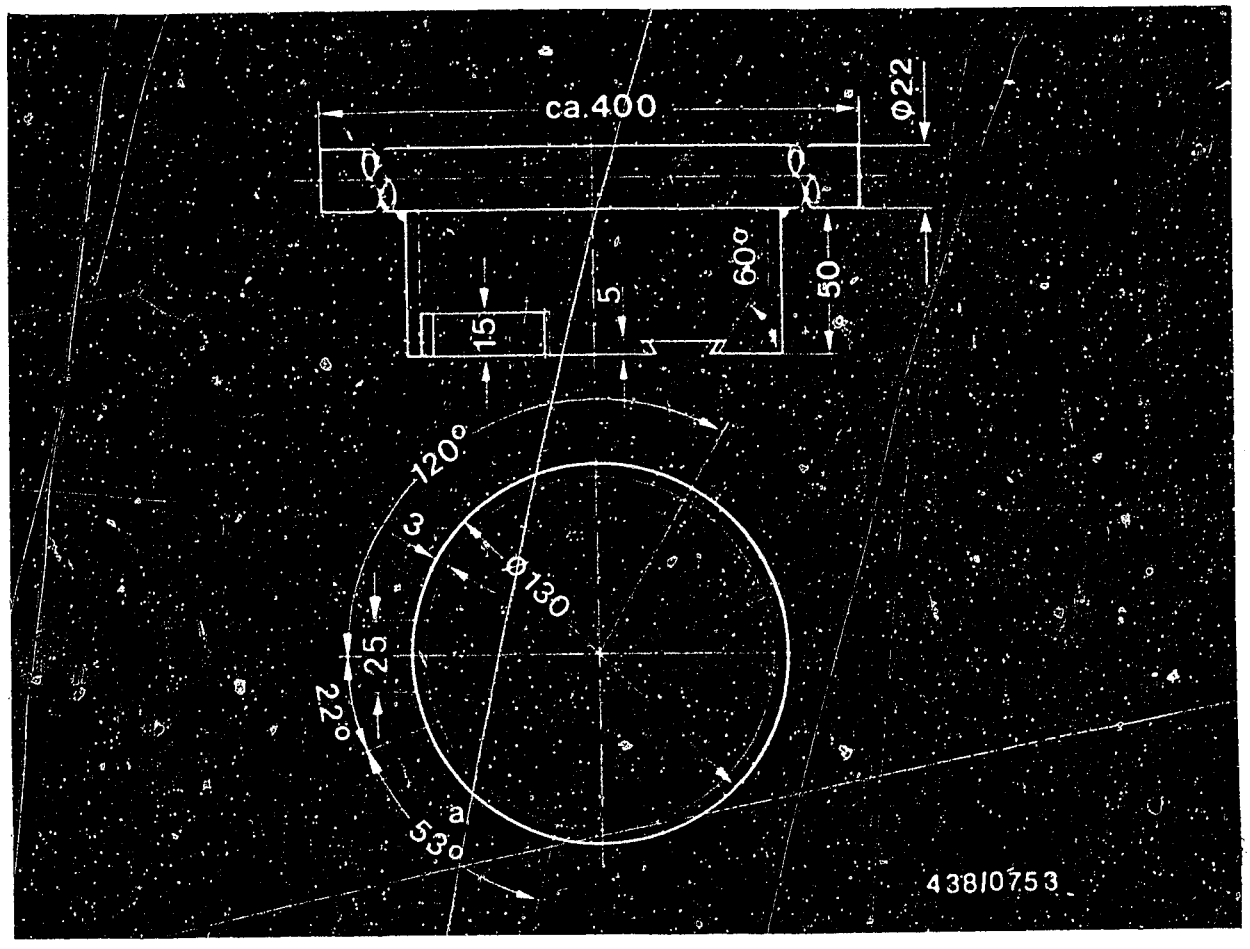
  Pressure regulator (Item 1) with pressure gauge 0 ... 4 bar gauge pressure (commercially available, e.g. Type No. 104 from Krais und Fritz, Stuttgart).

  Adjustment throttle (Item 2) Bosch 0 688 130 132.

  Pressure gauge (Item 3) 0 ... 1.6 bar gauge pressure, quality class 1.0 (commercially available, e.g. Wika No. 4184).

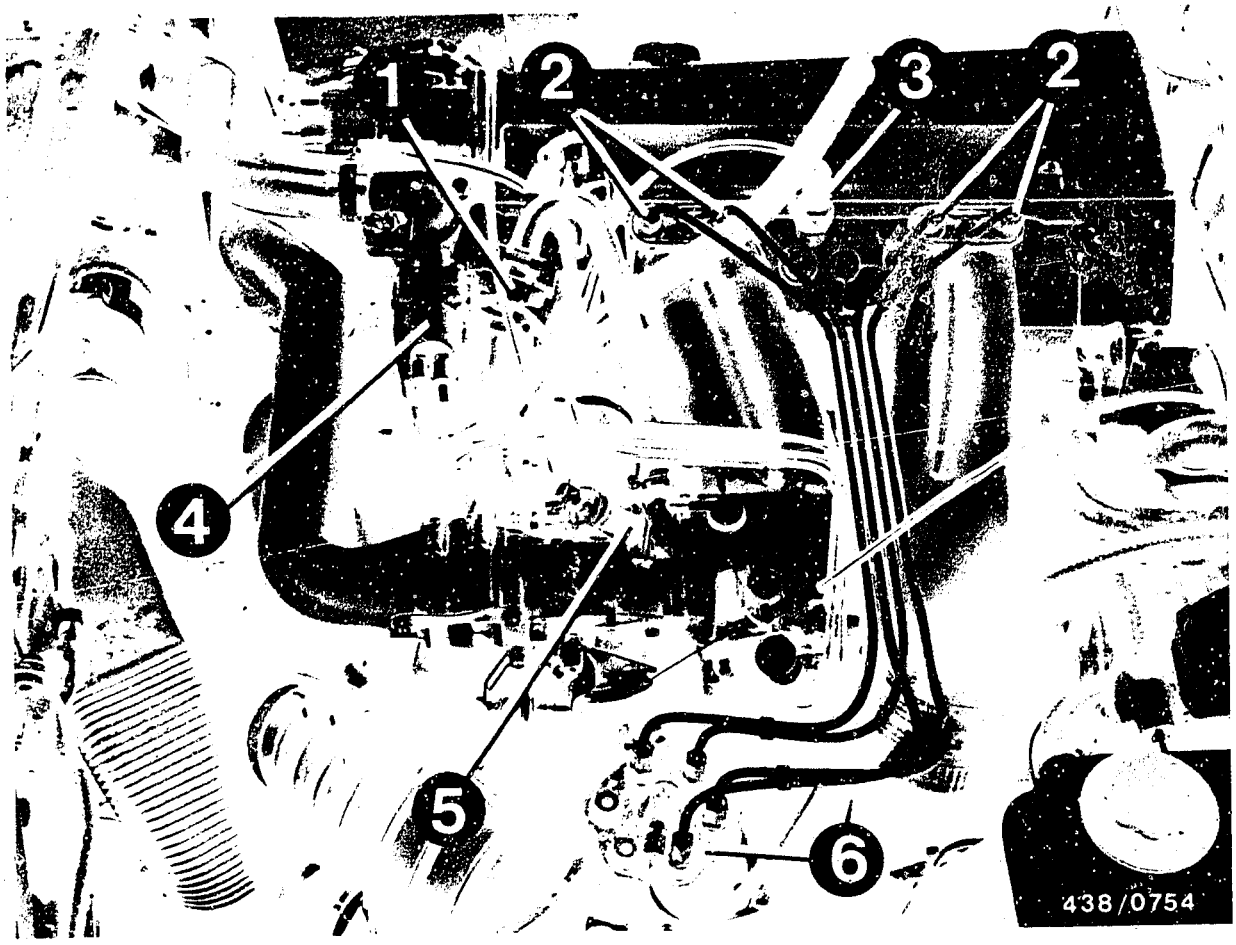
Note:

The equipment listed is frequently already available in the diesel workshop where it is used for testing the manifold-pressure compensators on diesel injection pumps.



a = Cutout

For removing and installing the electric fuel pump on the 1978/1979 model it is necessary to have a special wrench which can be user-fabricated according to the above sketch.



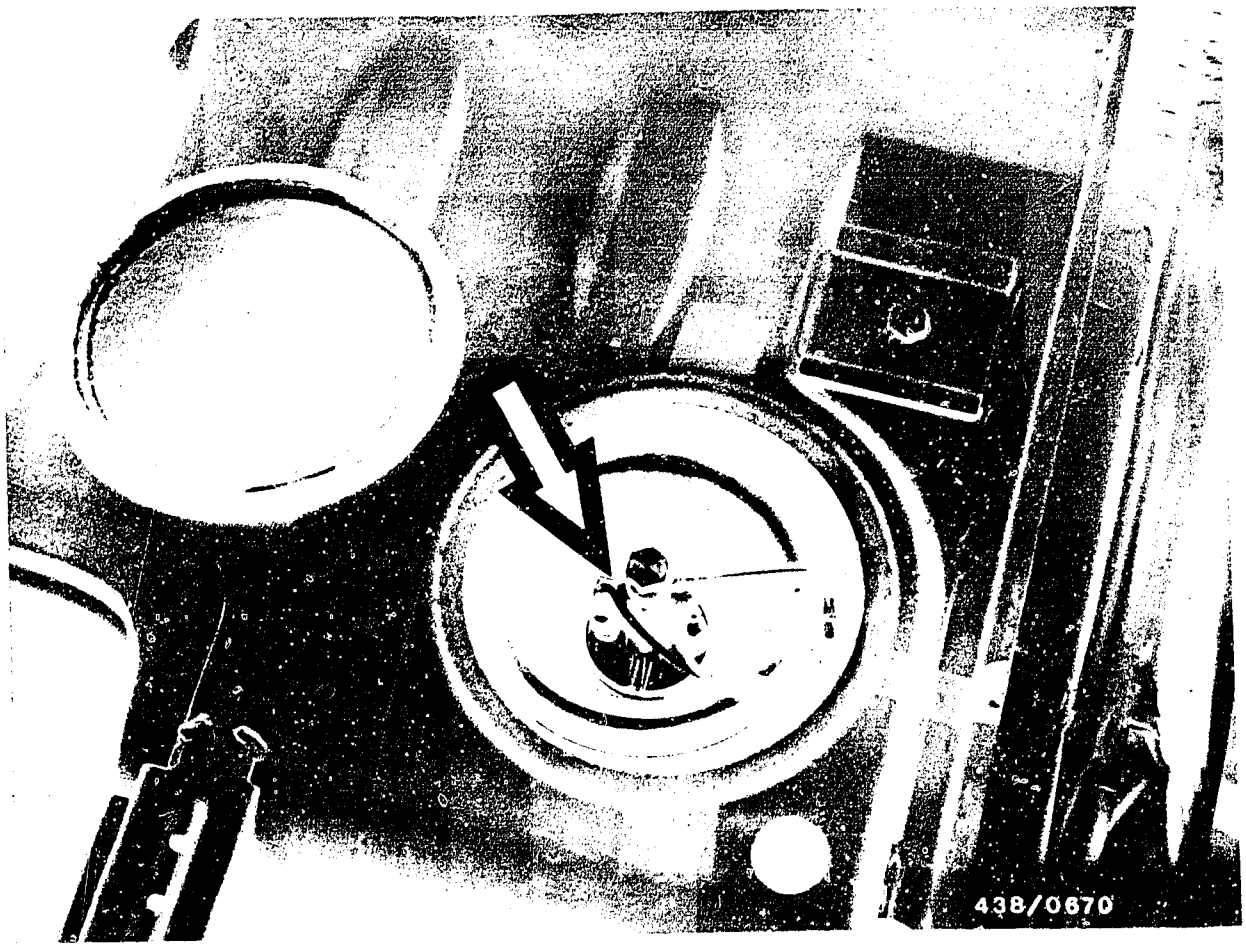
6. INSTALLATION POSITION OF COMPONENTS

(For installation position of the componenets for lambda closed-loop control, see Line J)

1 = Auxiliary-air device
2 = Injection valves
3 = Thermo-time switch
4 = Warm-up regulator
5 = Start valve
6 = Mixture-control unit

Not visible in the illustration:

- Fuel filter on inside left-hand wheel house.
- Fuel accumulator: 78/79 model on the side of the fuel tank, left.
  Model from 1980, in front of the fuel tank, right.



The electric fuel pump (arrow) is installed in the fuel tank. It is made accessible by removing the luggage-compartment floor board and the round cover plate in the floor assembly.

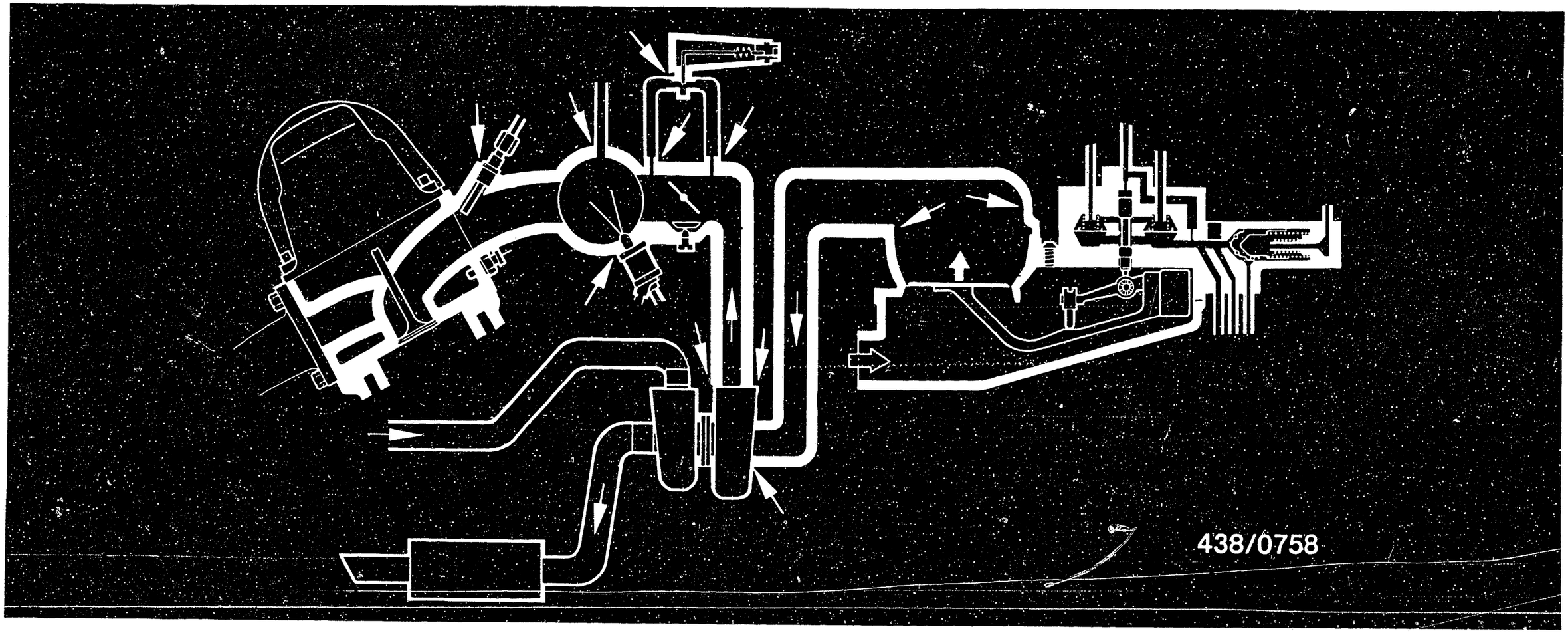
7. TROUBLE-SHOOTING CHART (see also coordinates B3/B4)

Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly, in warm condition	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operating on the road, high load	7. Insufficient power	Cause	Coordinates
●	●	●	●	●		●	Lambda closed-loop control system not operating (models with lambda closed-loop control)	J 1
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 7
	●						Position of the air-flow sensor plate incorrect	B 15
●		●					Auxiliary-air device does not open	B 19
							Auxiliary-air device does not close	B 19
●	●				●		Electric fuel pump not operating	C 1
●							Cold-start system defective	C 17
		●	●				Cold-start valve leaking	C 17
				●			Excessive fuel quantity for control-pressure circuit	D 4
●		●					"Cold" control pressure outside tolerance	D 1
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	D 1
			●	●		●	"Warm" control pressure too low (after warm-up)	D 1
					●	●	Primary (system) pressure outside tolerance	E 1
	●						Overall fuel system leaking	E 9
●	●	●	●		●		Injection valves leaking, opening pressure too low	F 1
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 10
●	●	●	●	●			Basic idle adjustment incorrect	G 1
						●	Throttle plate does not open completely	---
						●	Turbocharger or charge-air pressure regulator defective	---
				●		●	Control system for warm-up regulator defective (pneumatic) (Mod. 80/81)	G 12
				●		●	Solenoid valve or pressure regulator for control-pressure reduction faulty (Mod. 78/79)	G 9

Customer complaint (fault symptom) (continued)

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idling-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinates
	●	●				●	Lambda closed-loop control system not operating (models with lambda closed-loop control)	J 1
		●		●			Vacuum system leaking	B 5
●		●	●	●			Air-flow sensor lever and/or control plunger not moving smoothly	B 7
●							Position of the air-flow sensor plate incorrect	B 15
							Auxiliary-air device does not open	B 19
					●		Auxiliary-air device does not close	B 19
						●	Electric fuel pump not operating	C 1
							Cold-start system defective	C 17
●	●		●				Cold-start valve leaking	C 17
							"Cold" control pressure outside tolerance	D 1
		●				●	"Warm" control pressure too high (after warm-up)	D 1
	●	●	●			●	"Warm" control pressure too low (after warm-up)	D 1
		●				●	Primary (system) pressure outside tolerance	E 1
							Overall fuel system leaking	E 9
●						●	Injection valves leaking, opening pressure too low	F 1
		●					Unequal fuel delivery (imbalance of fuel delivery)	F 10
●	●	●	●	●			Basic idle adjustment incorrect	G 1
							Throttle plate does not open completely	---
	●	●					Control system for warm-up regulator defective (pneumatic)	G 12
					●		Operating or setting of throttle plate damper faulty	H 16



Working steps

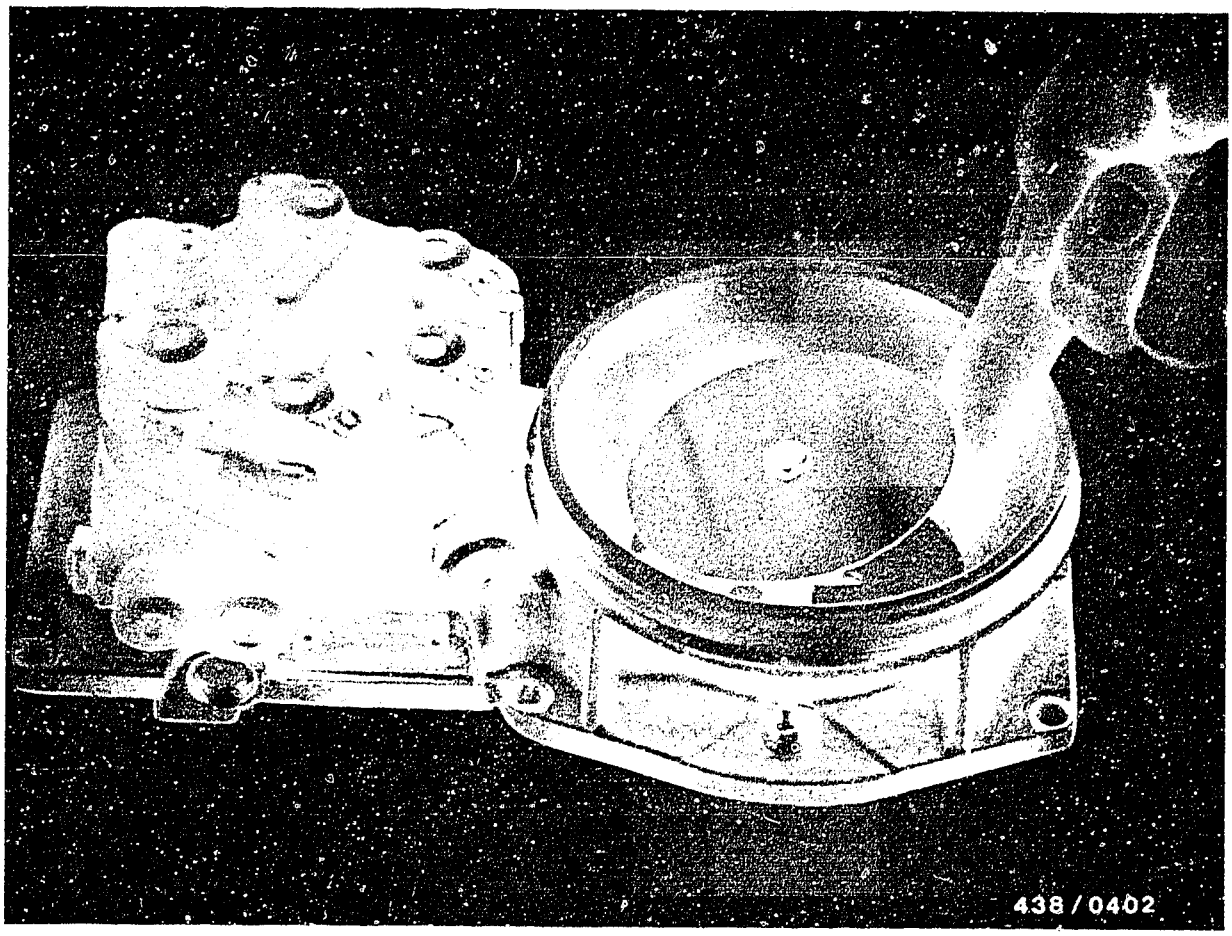
8. Check the vacuum system (air-intake system) of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).
Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak. If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature: Idle-speed adjustment is described on Coordinates G 1.

9. CHECK THE CONTROL LEVER IN THE AIR-FLOW SENSOR AND THE CONTROL PLUNGER IN THE FUEL DISTRIBUTOR FOR EASE OF MOVEMENT

9.1 Preparations

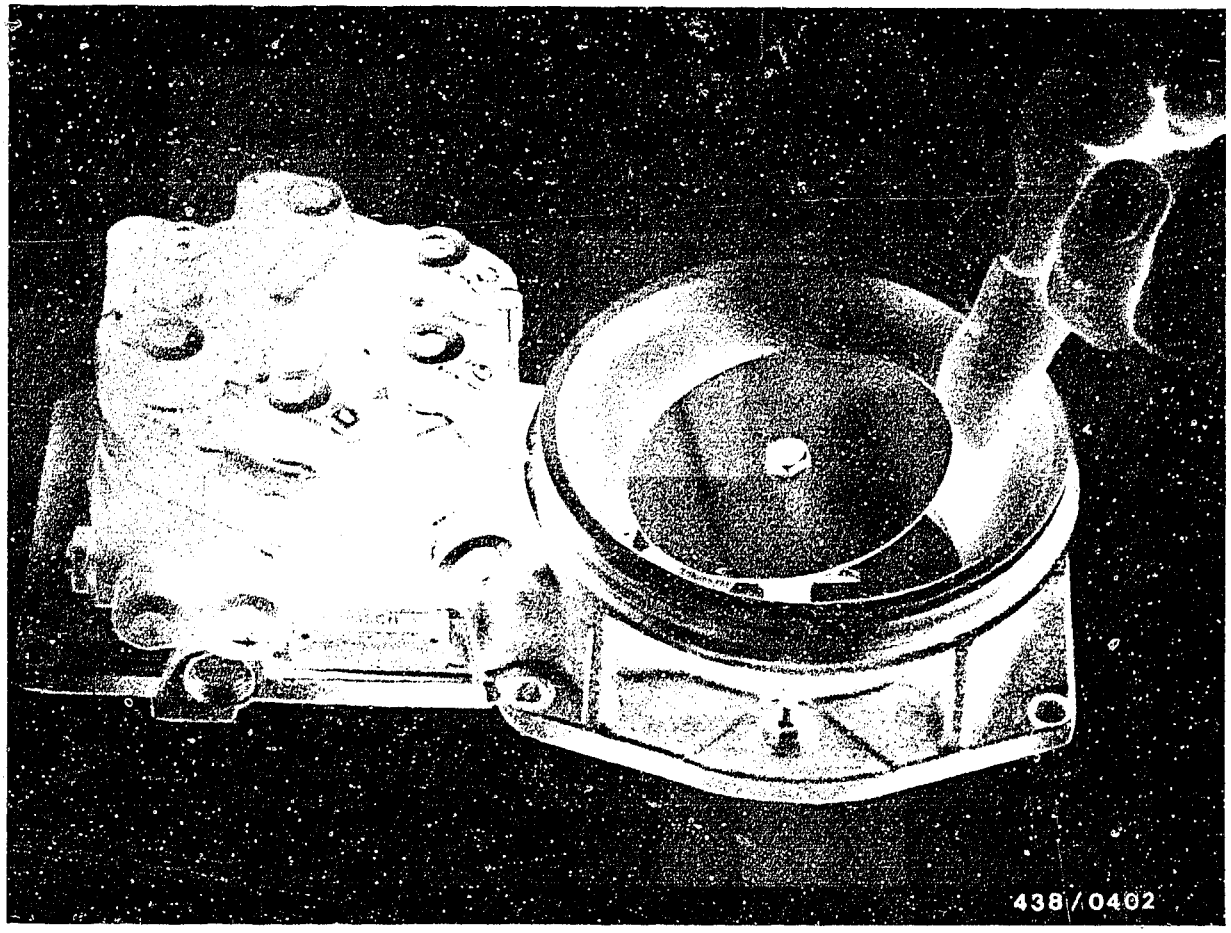
- Engine temperature not below +20°C
- Remove the rubber dome from the air-flow sensor so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.



9.2 Check that the control lever moves freely

Lift the air-flow sensor by hand and let it drop.
The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop.
If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the control lever moves freely once the fastening screws are released, then the seal between the air filter and the air-flow sensor should be changed (Saab replacement part).
Tighten the screws uniformly cross-wise.

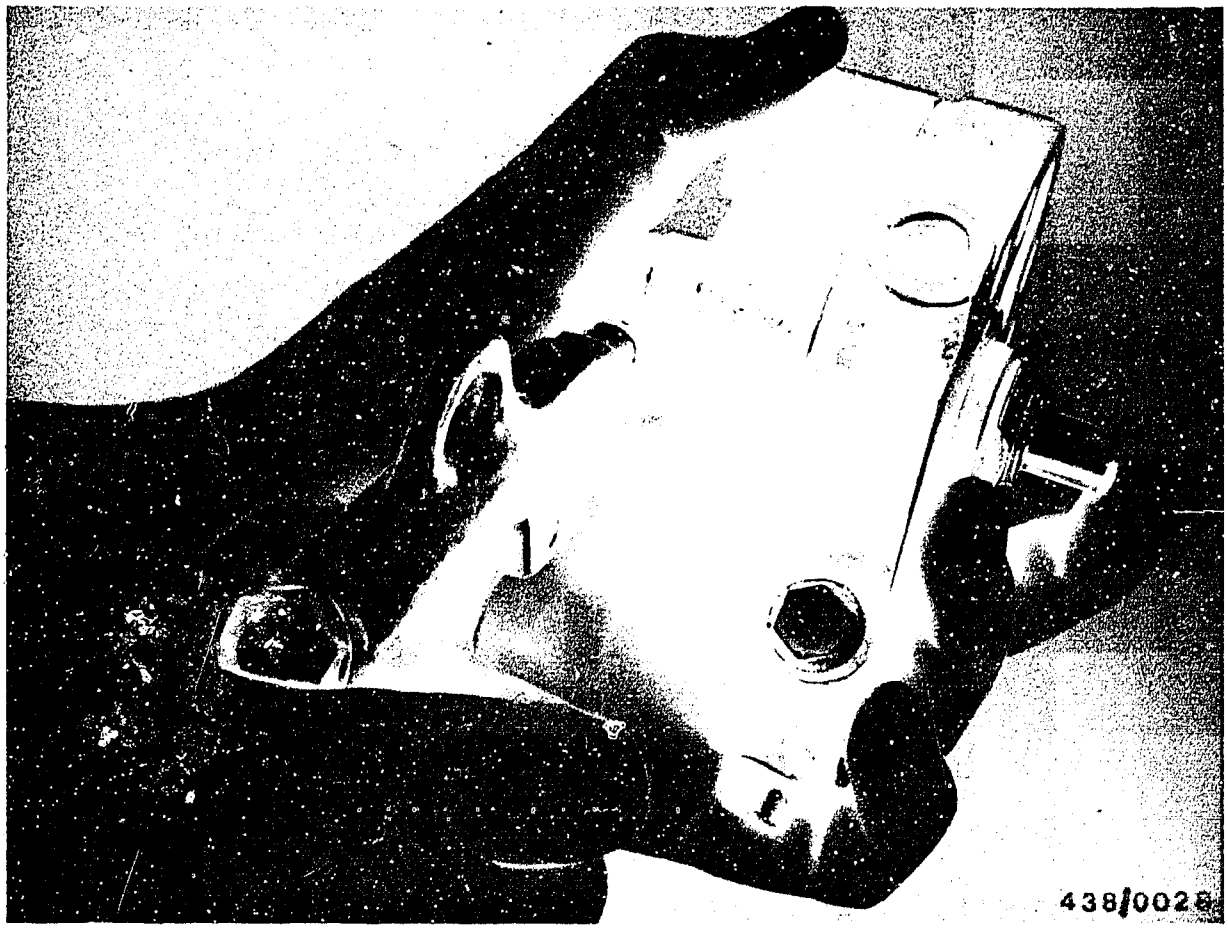
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely

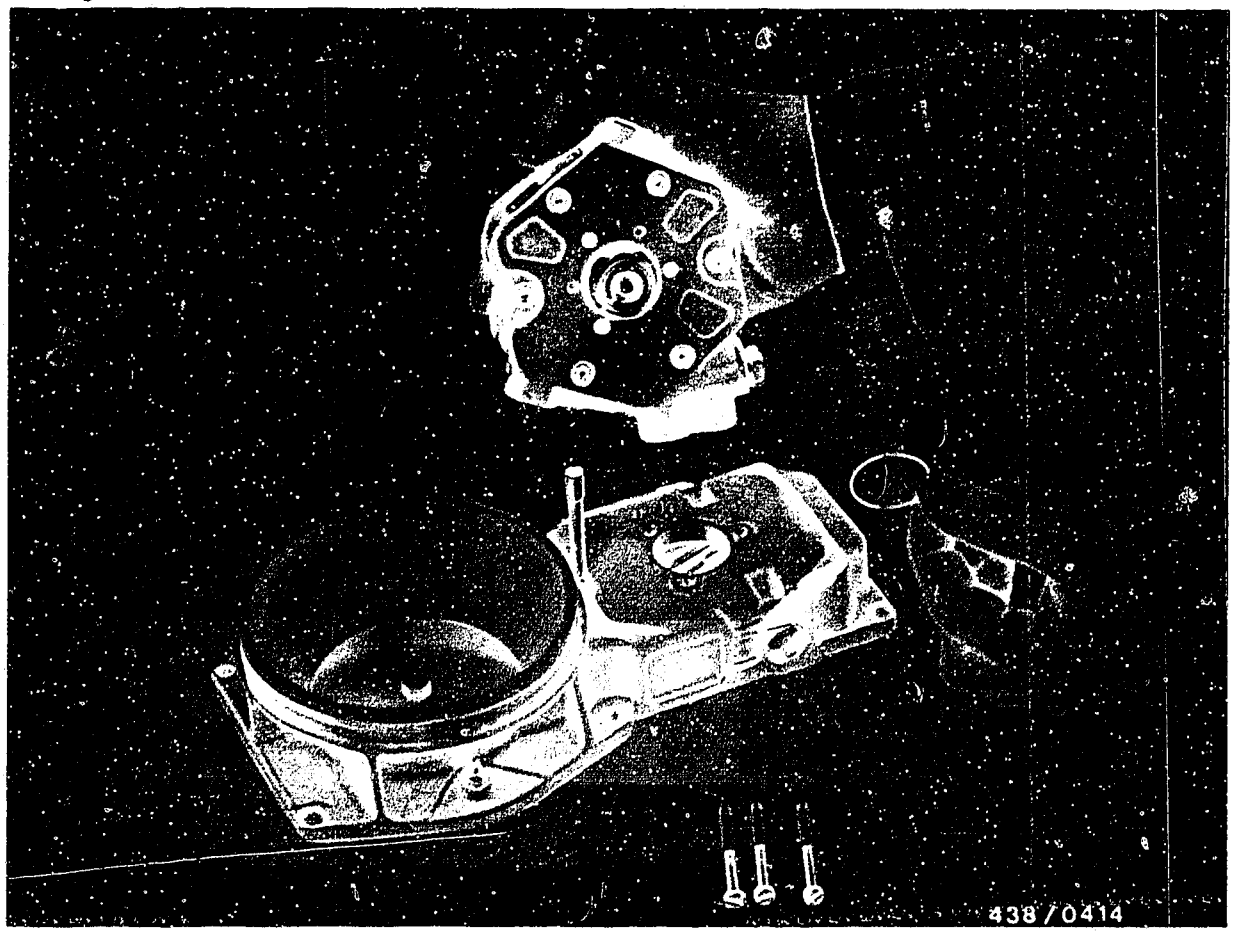
Lift the air-flow sensor plate by hand. Equal resistance should be felt the whole time.
Move the sensor plate quickly back to just before the zero position.
The control plunger which follows only sluggishly must make noticeable contact with the sensor plate lever. If this happens, then the control plunger can move freely.
If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!
Note the following when installing fuel components and fuel lines:
Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.
The steel tubing must not be bent!

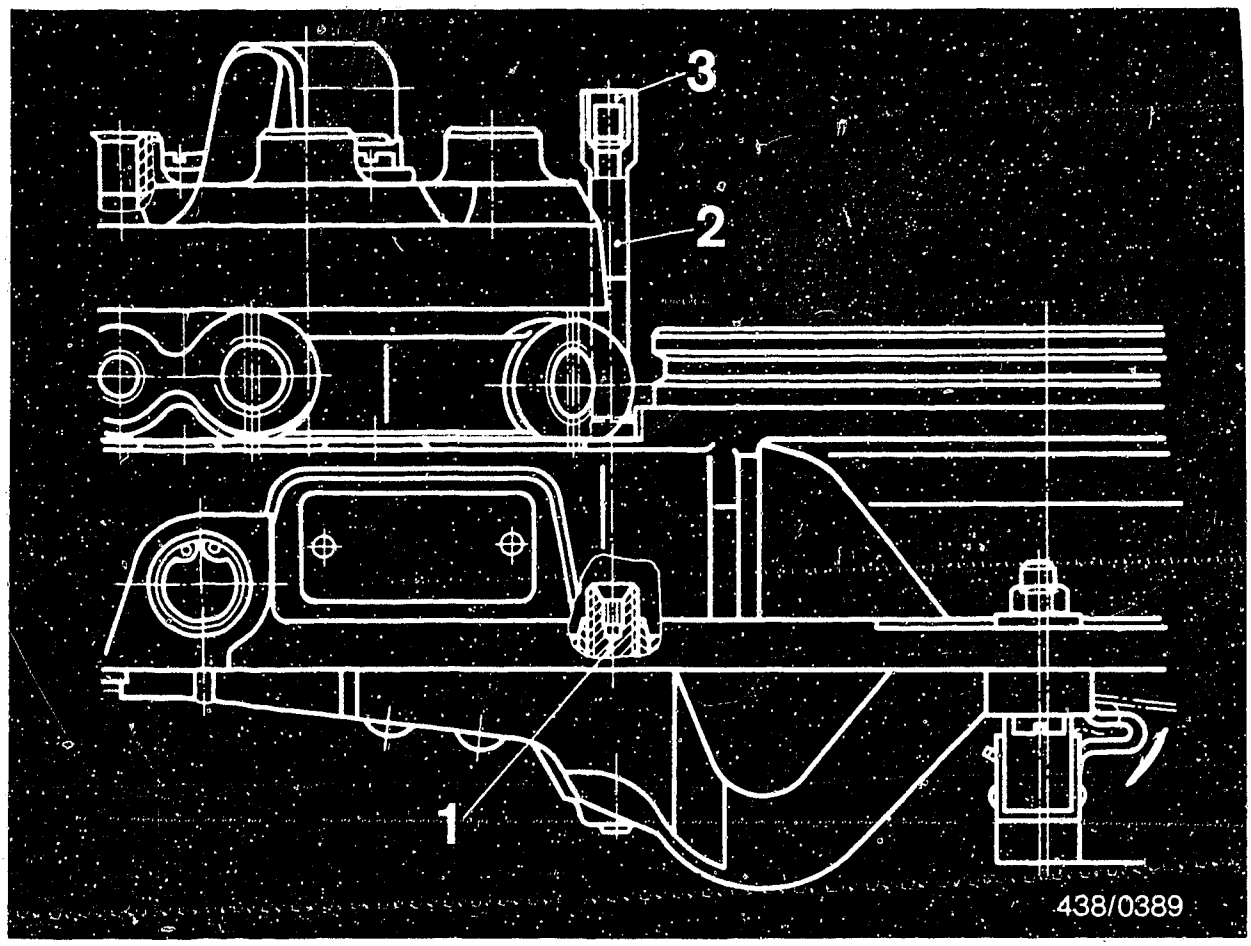
Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.



9.4 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32...0.38 kgfm) for the fastening screws precisely.

When connecting the fuel-injection tubing, use new seal rings.

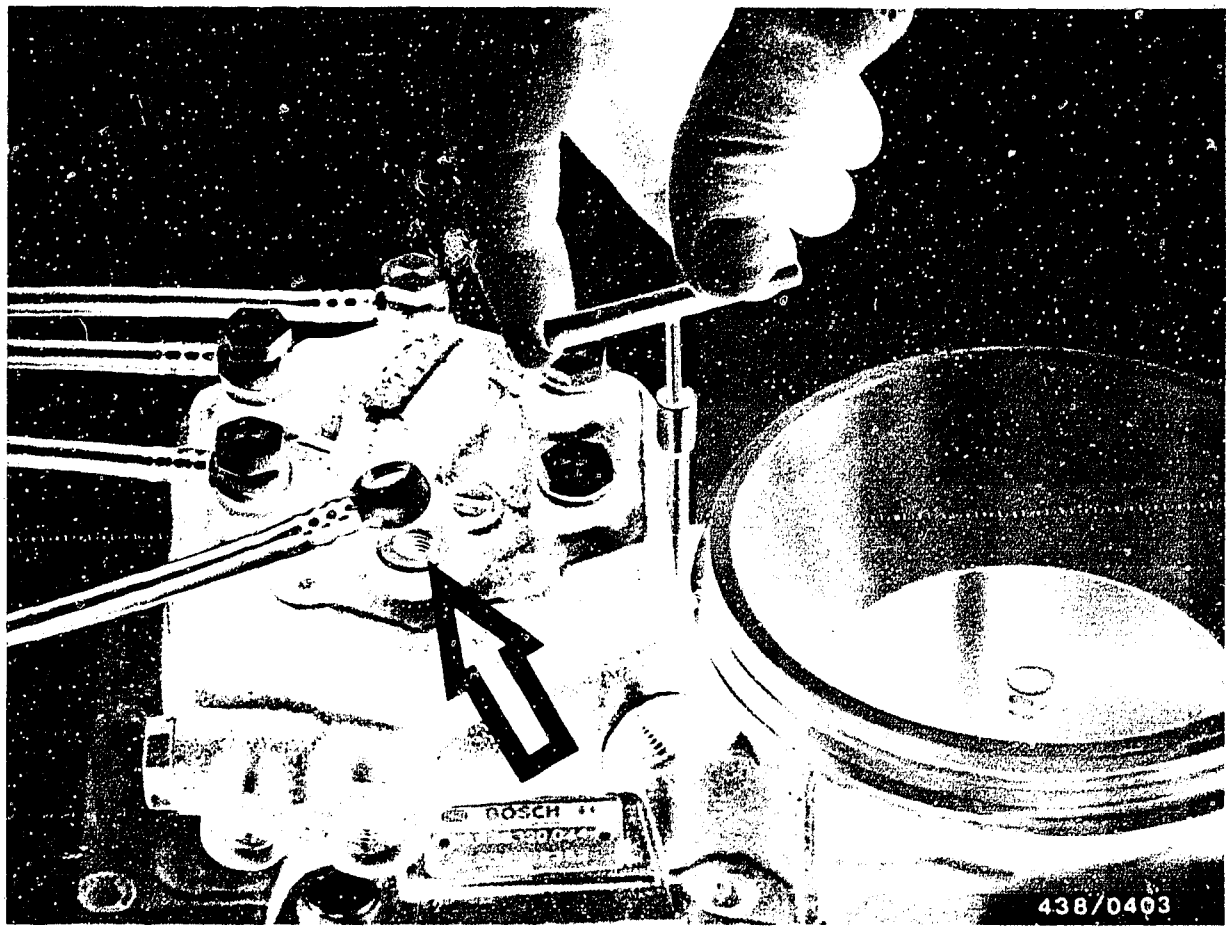


1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Lead seal

9.6 Matching the fuel distributor to the air-flow sensor for initial starting:

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.

The idle-mixture-adjusting screw is adjusted via a guide tube rigidly fitted on the mixture-control unit.

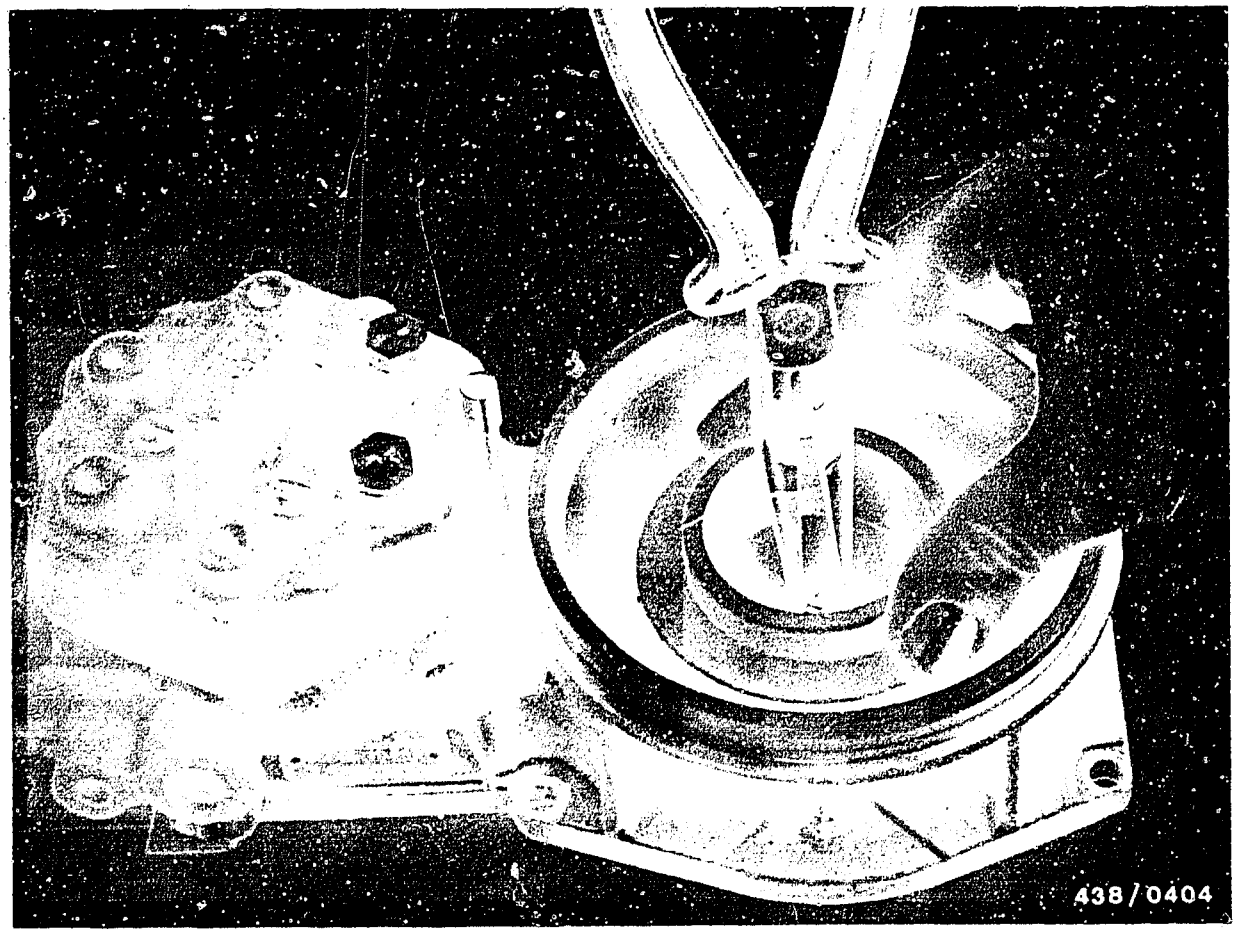


Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinate G 1.



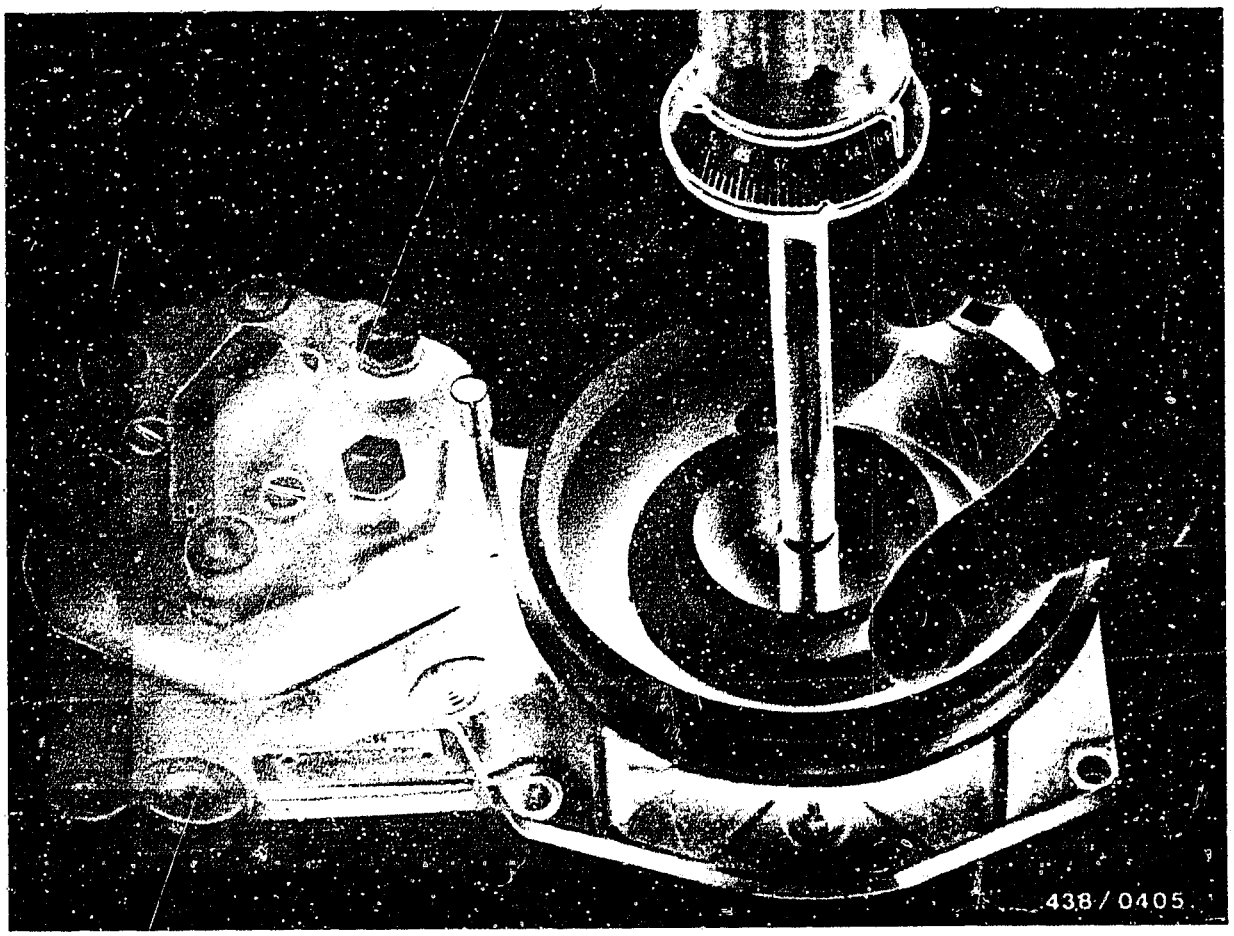
10. CHECKING AND ADJUSTING THE POSITION OF THE AIR-FLOW SENSOR PLATE

10.1 Preparations

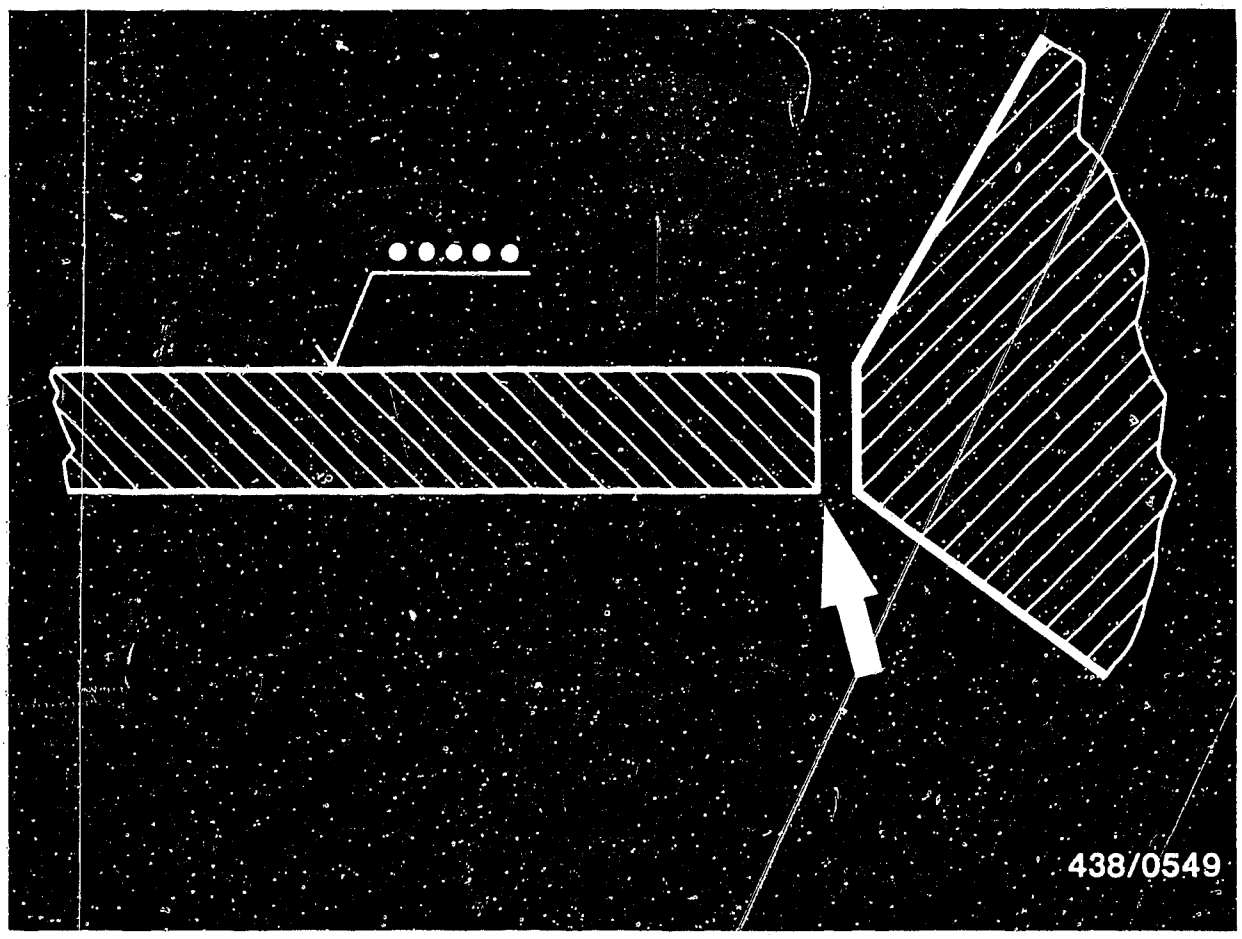
- Engine temperature is not important.
- Remove the rubber dome from the air-flow sensor (loosen clamp) so that the air-flow sensor plate of the air-flow sensor becomes accessible.

10.2 Centring the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, centre it using a positioning ring KDEP 1040/10 (Ø 80 mm) as follows:
Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.

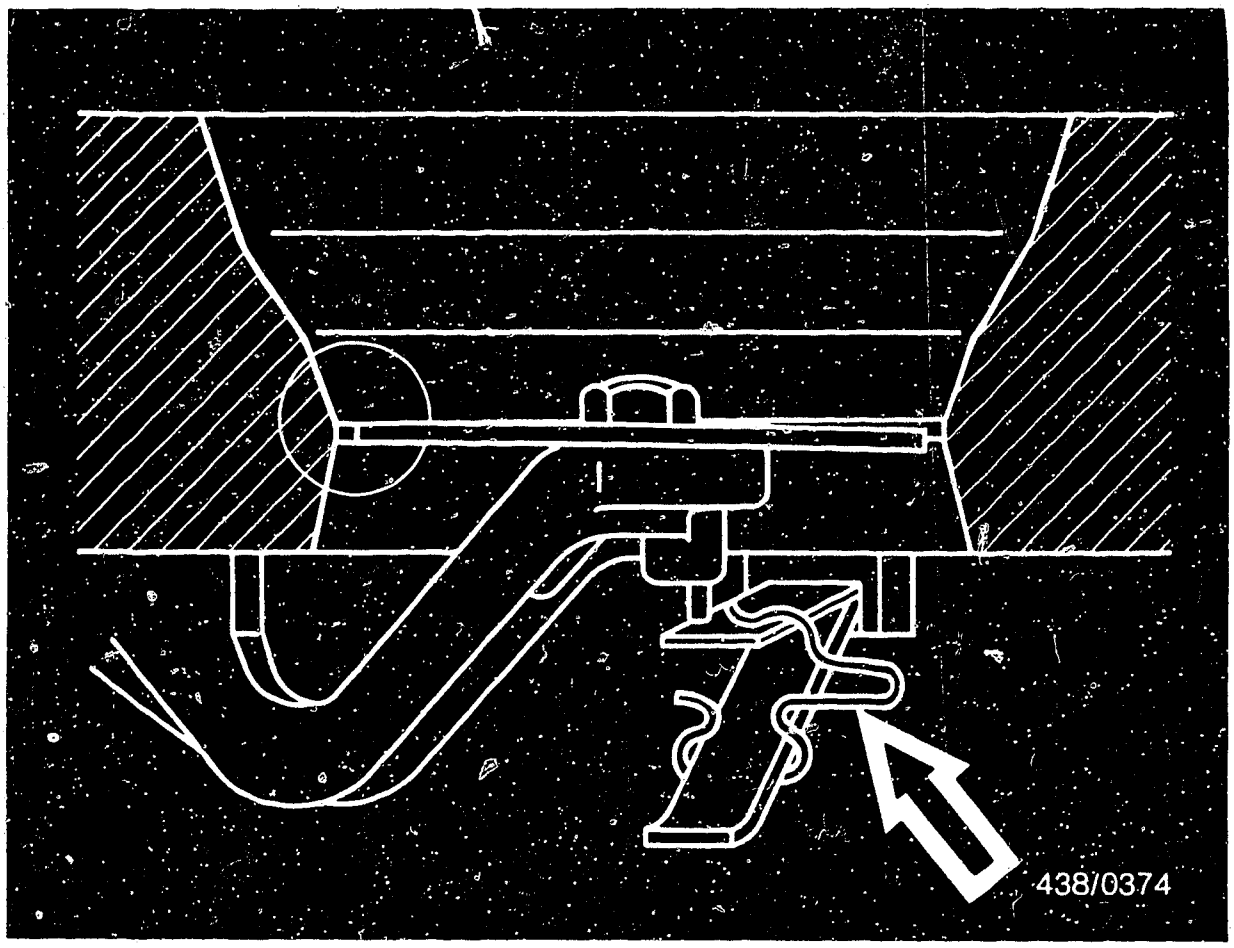


With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).
It must no longer be possible to turn the air-flow sensor plate by hand.



Caution

Be sure that sensor plate is mounted in correct position! Its upper side is identified by five punch marks (in a row).
The sharp edge (arrow) is at the bottom.

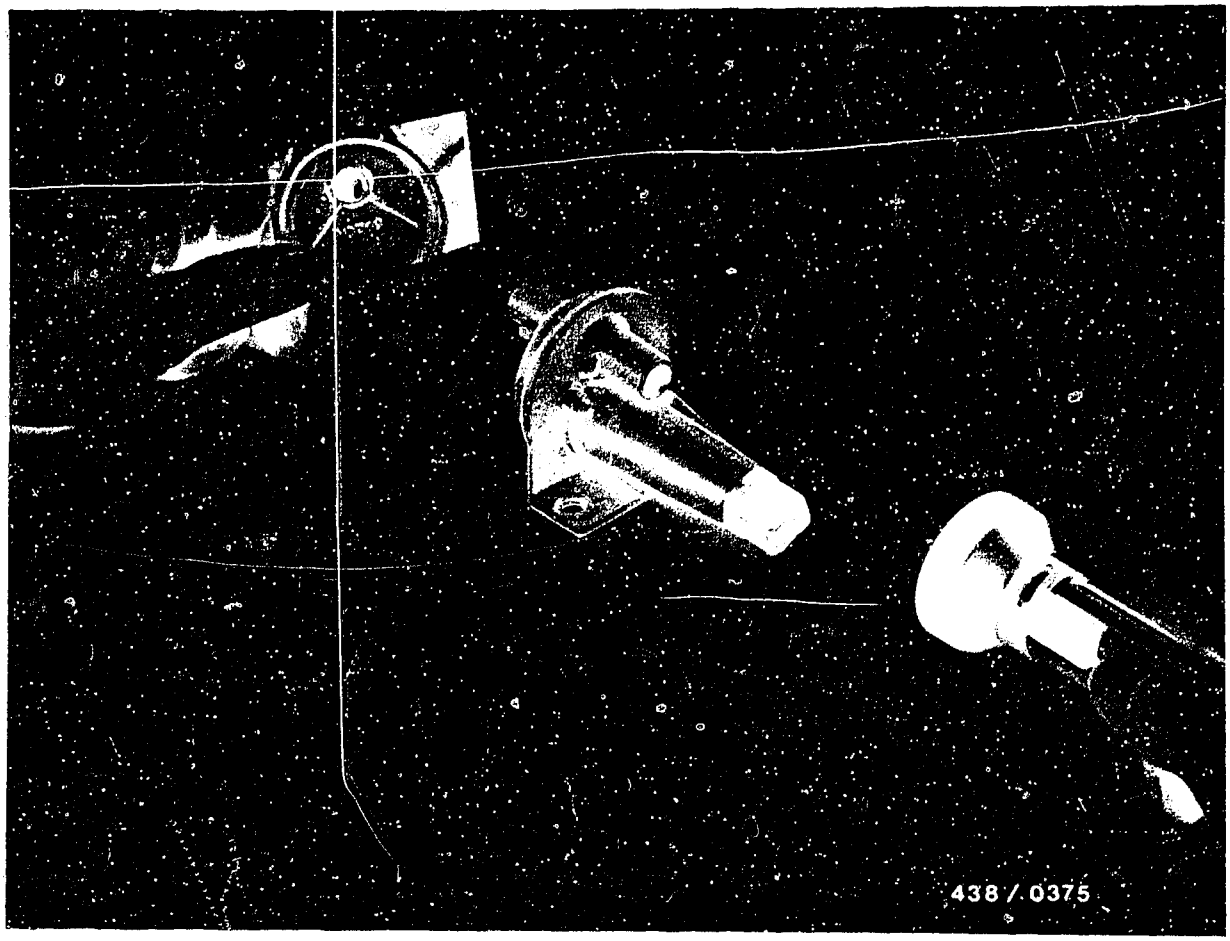


10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the edge of the cone at the point shown in the diagram. A maximum of 0.5 mm deeper is admissible, but the sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.

If necessary, the position of the stop leaf spring can be corrected by bending the shaped spring (arrowed).



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. CHECKING THE OPERATION OF THE AUXILIARY-AIR DEVICE

The engine must be cold.

Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator
Disconnect both air hoses from the auxiliary-air device.

Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.

- Fit the electric cable plug on the auxiliary-air device.

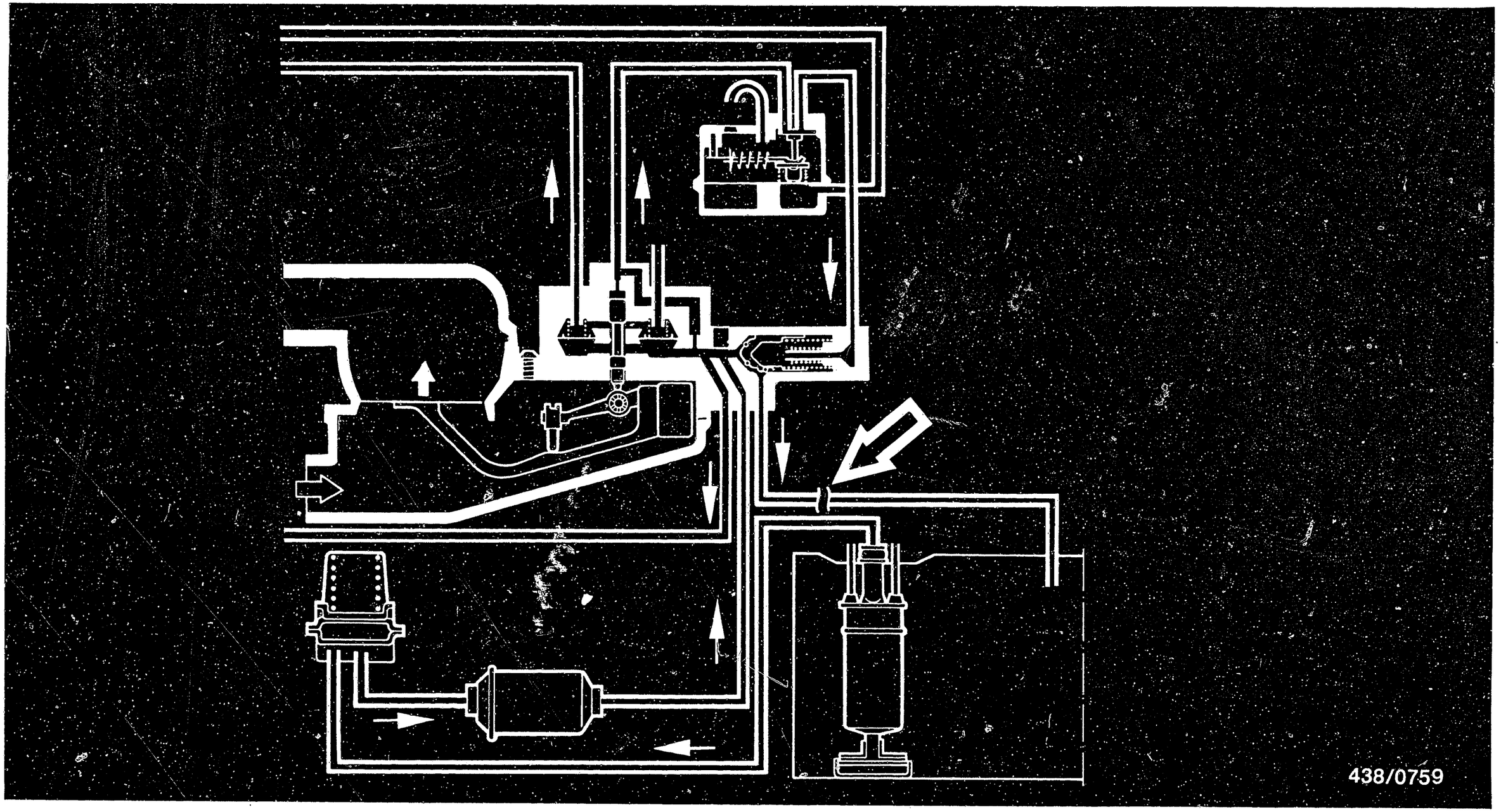
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.
  After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  Minimum voltage across the connector 11.5 V with the engine stopped.

- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.

- Replace the auxiliary-air device if defective.

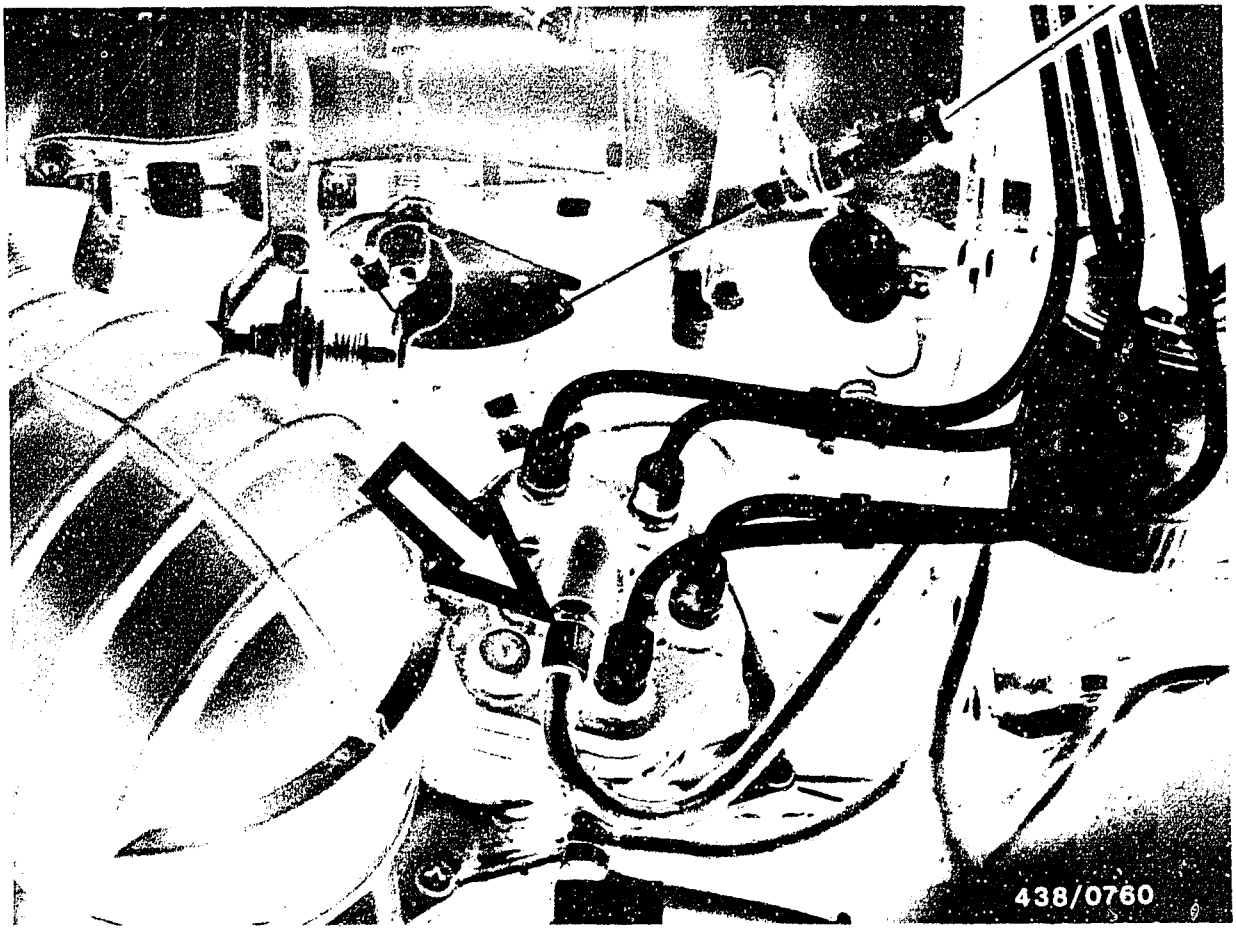
When the auxiliary-air device has been replaced, readjust the idle speed with the engine at normal operating temperature. Idle adjustment is described on Coordinates G 1.



12. CHECKING THE OPERATION OF THE ELECTRIC FUEL PUMP

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Measuring point:

A suitable measuring point for fuel-delivery testing is the return port (arrow) on the fuel distributor. Unscrew the fuel return line. Equip a test hose with an inlet union (dia. 12 mm) and connect to the return port of the fuel distributor.

Hold the end of the hose in a graduate (approx. 1.5 litre capacity) in order to make the measurement.

12.3 Checking:

Pull off the plug from the warm-up regulator and auxiliary-air device. Switch on the electric fuel pump for 30 seconds by bridging the safety circuit and collect the fuel delivered in a graduate.

12.4 Test specification:

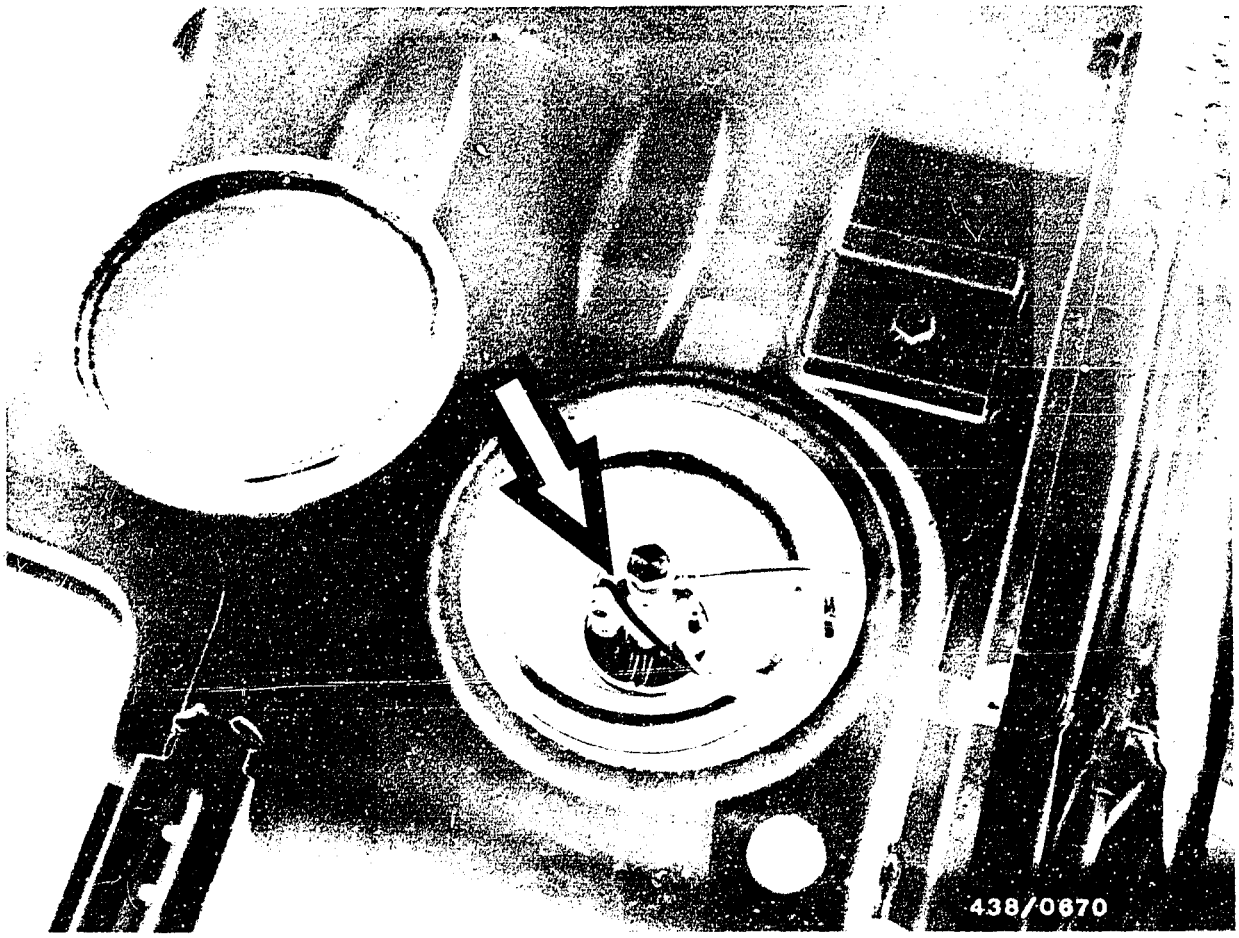
Fuel delivery: at least 950 cm^3/30 seconds.

12.5 Possible causes of insufficient fuel delivery:

- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.

- Fuel filter very dirty.

If these points are O.K., the fault lies in the electric fuel pump itself.
Replace the electric fuel pump.

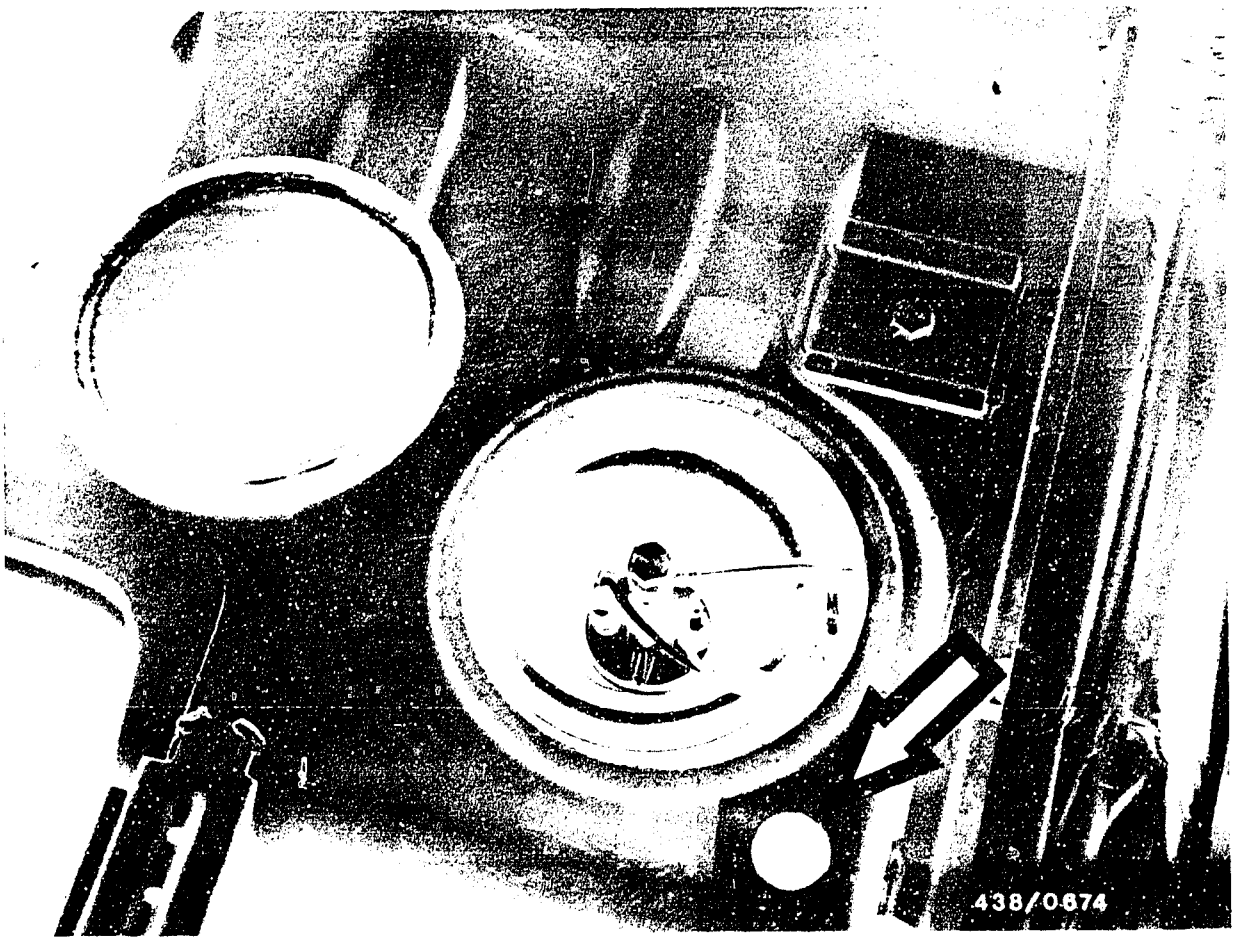


12.6 Removing and installing the electric fuel pump:

Remove the floor board from the luggage compartment and lift off the round cover plate (in the floor assembly).

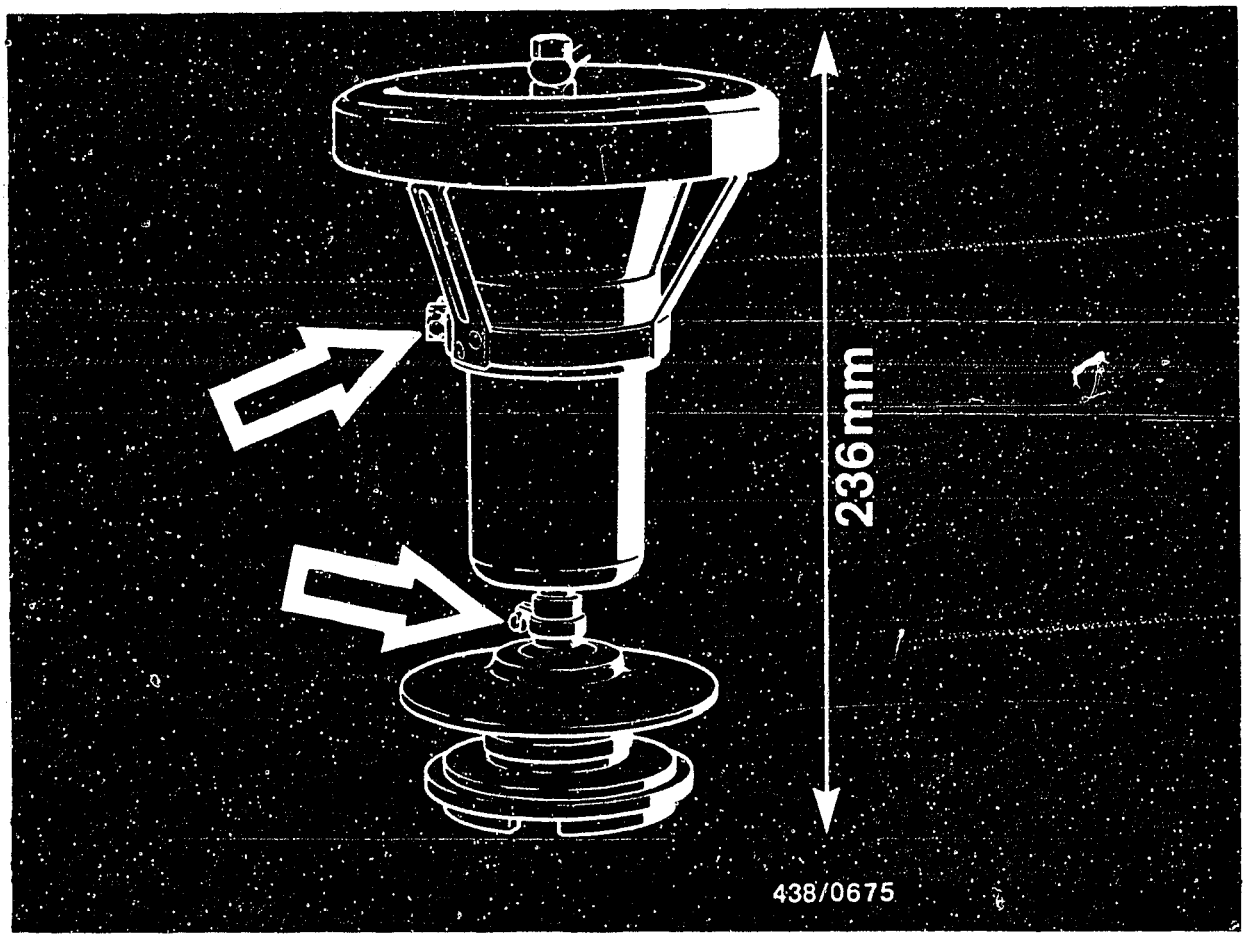
Remove the electric plugs from the electric fuel pump.

Unscrew the inlet-union screw of the fuel line, applying counter-force at the fixed hexagonal section on the electric fuel pump.



Loosen the clamping band for the rubber mounting of the electric fuel pump. To do this, use an offset screwdriver or a flex-head screwdriver. The flex-head screwdriver can be inserted through the specially provided hole (arrow; remove rubber grommet).

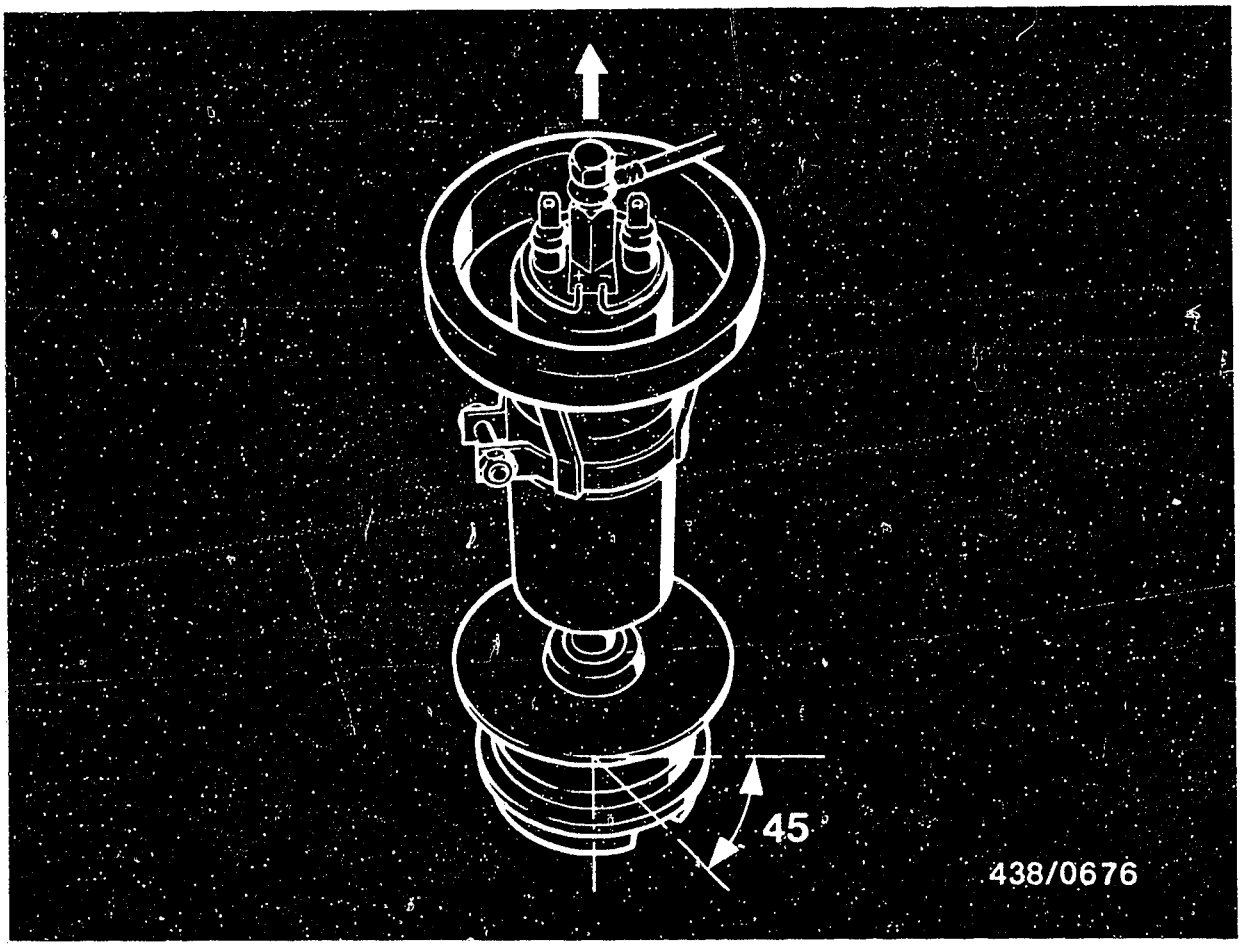
Lift complete unit - rubber mounting with electric fuel pump and intake strainer - out of the fuel tank.



Loosen the clamping bands for the intake strainer and rubber mounting (arrows) and remove both parts from the electric fuel pump.

Slip the intake strainer fully onto the intake fitting of the new electric fuel pump and, for the time being, lightly fasten the clamping band.

Fit the rubber mounting so that the distance between the bottom edge of the intake strainer and the top edge of the rubber mounting is 236 mm.

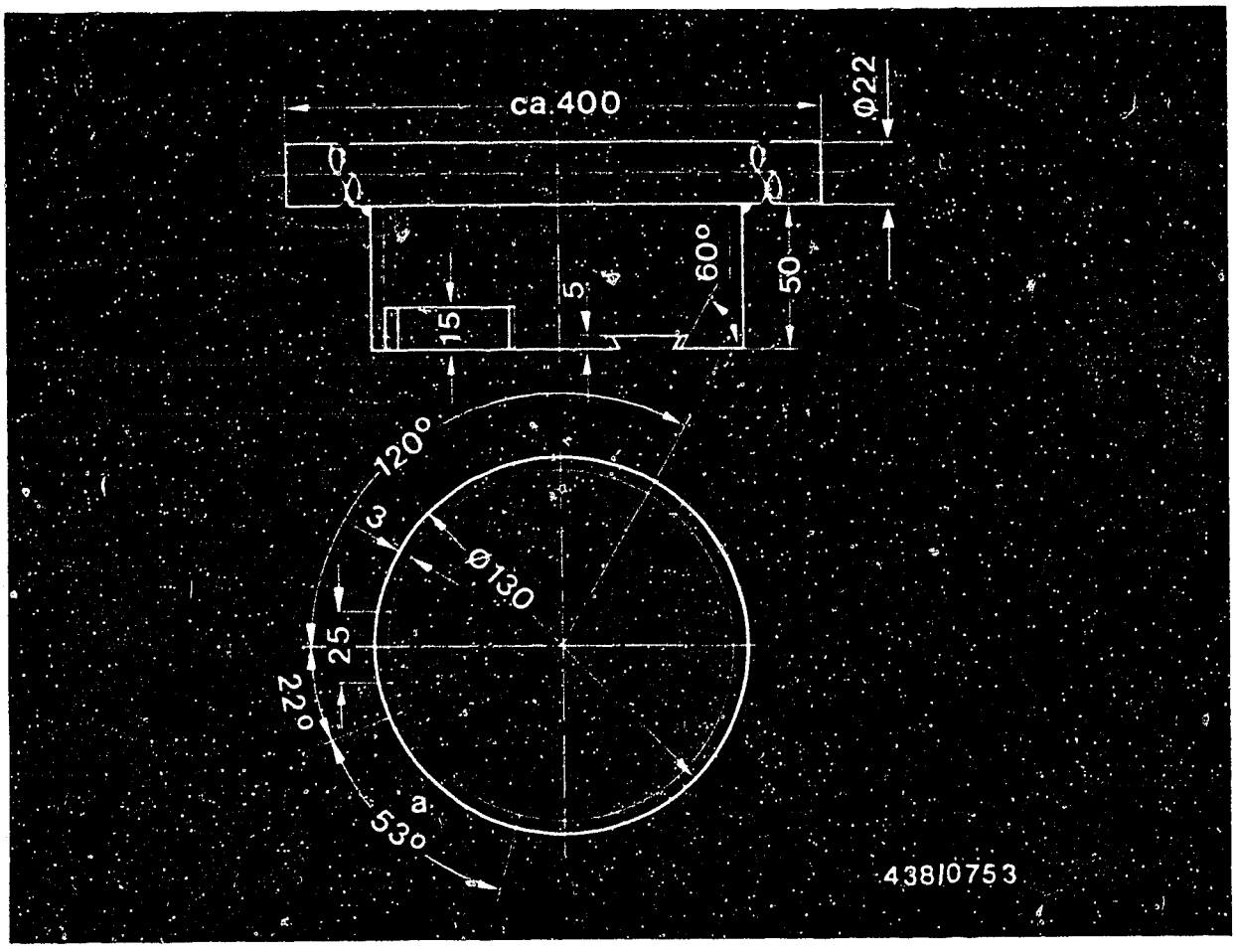


Install the complete pump unit as follows in the fuel tank:

The two electric terminals must be at 90° to the direction of travel; positive terminal on the left-hand side as viewed from behind the vehicle.

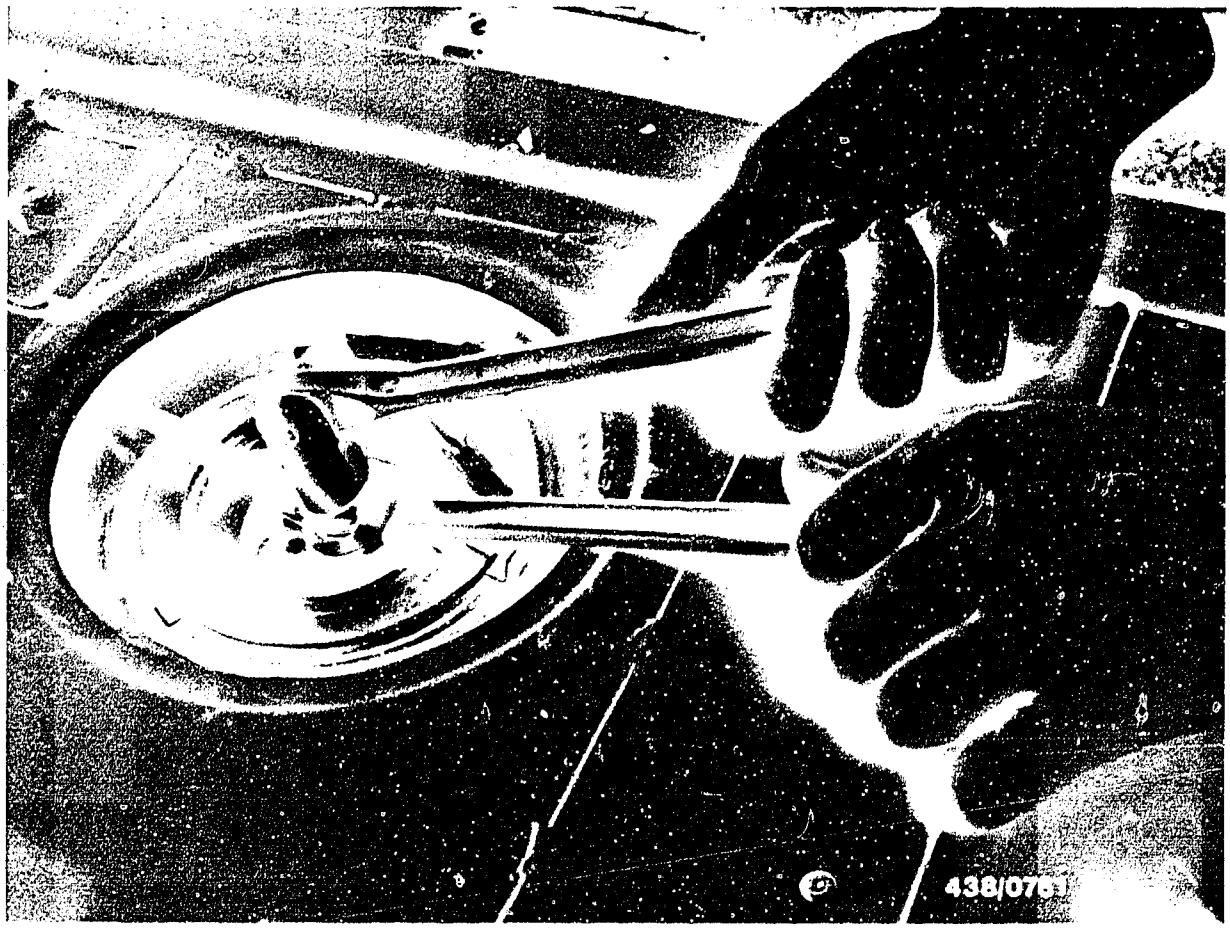
Turn the intake strainer so that the centre of the intake opening is at approx. 45° at the rear right. Then finally tighten the clamping band of the intake strainer.

Arrow in picture = direction of travel.



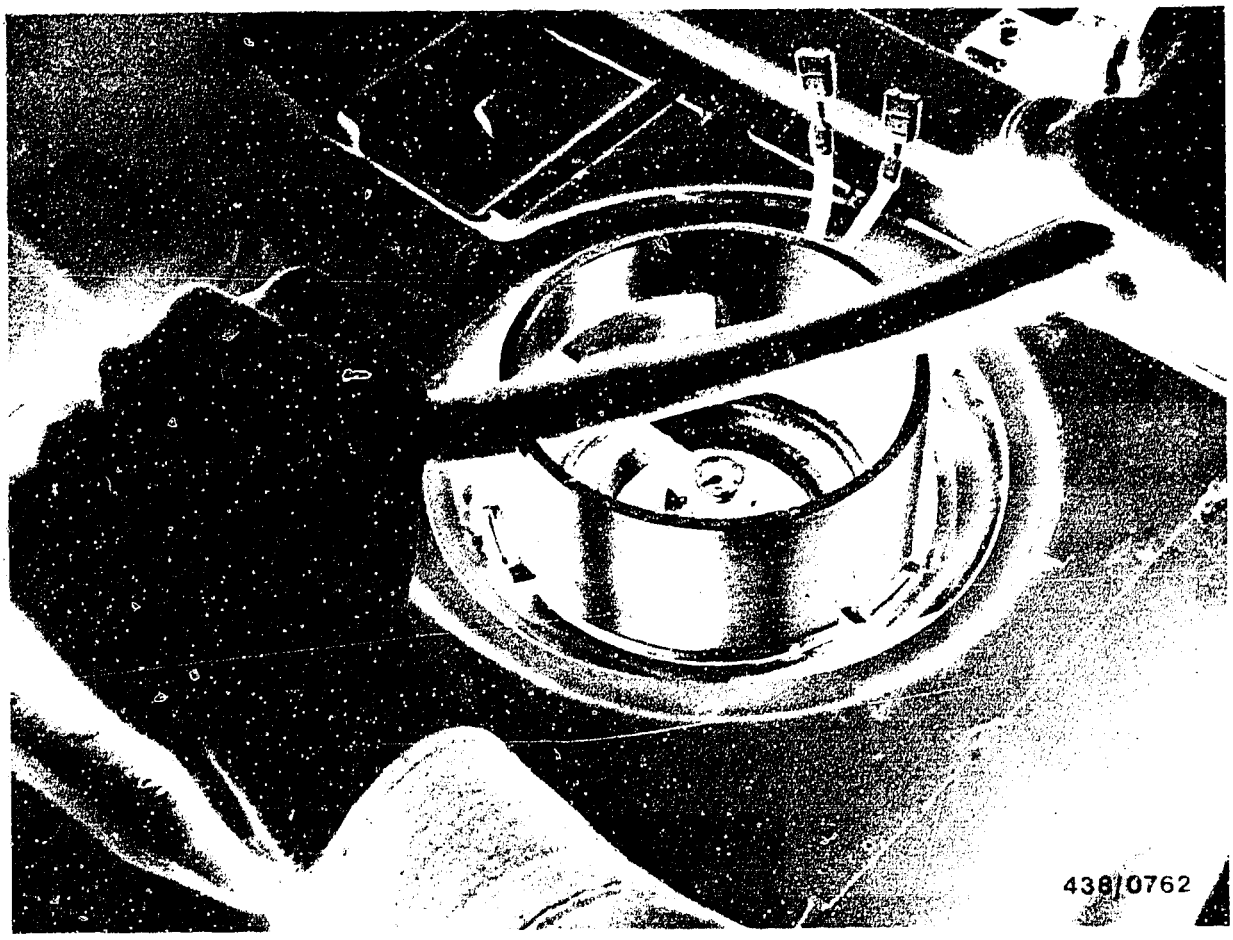
12.7 Removing and installing the electric fuel pump on the 1978/1979 model:

A special wrench is required for removal and must be user-fabricated according to the above sketch.



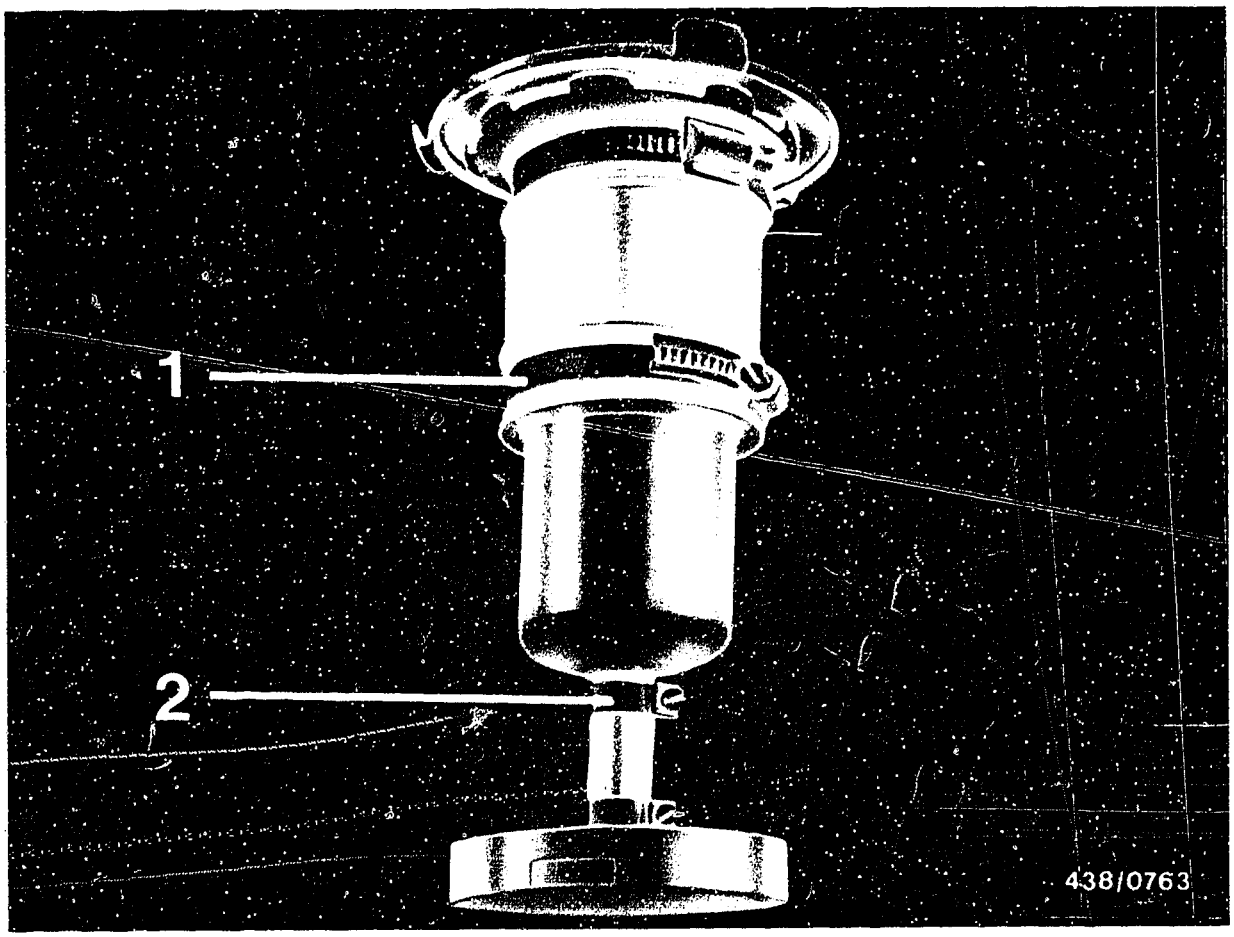
Remove the luggage-compartment carpeting or floor board (station wagon, Coupé). Remove the round cover plate from the luggage-compartment floor.

Remove the electric connections from the electric fuel pump and unscrew the fuel line.

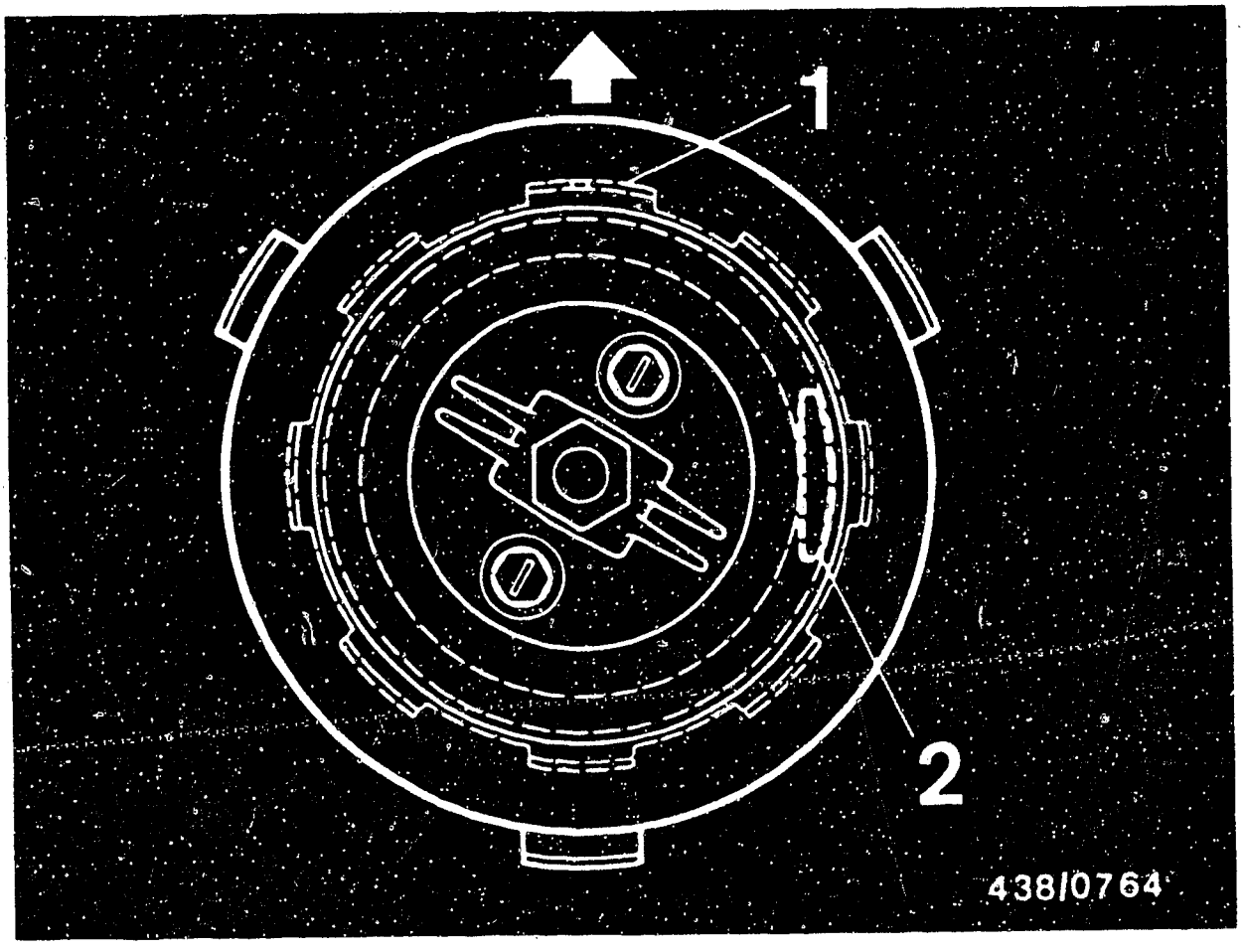


Using the special wrench, loosen the holding plate of the electric fuel pump by turning as far as it will go in a counterclockwise direction.

Remove the complete pump unit from above together with holding plate and intake strainer.



In order to replace the electric fuel pump, loosen the two hose clips 1 and 2.

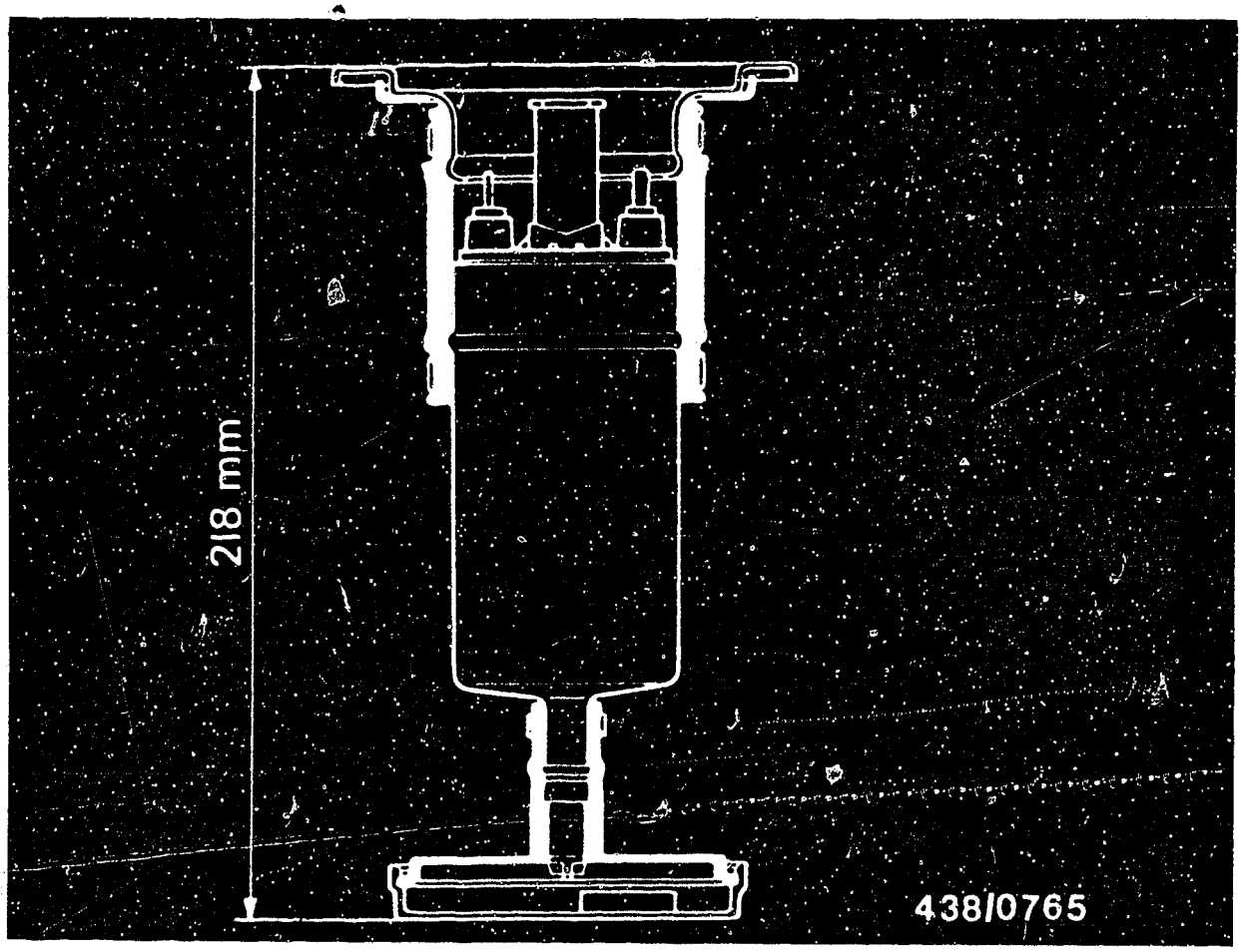


Arrow = direction of travel
1 = Wider holding lug
2 = Suction opening in intake strainer

Note the following when assembling the pump unit:

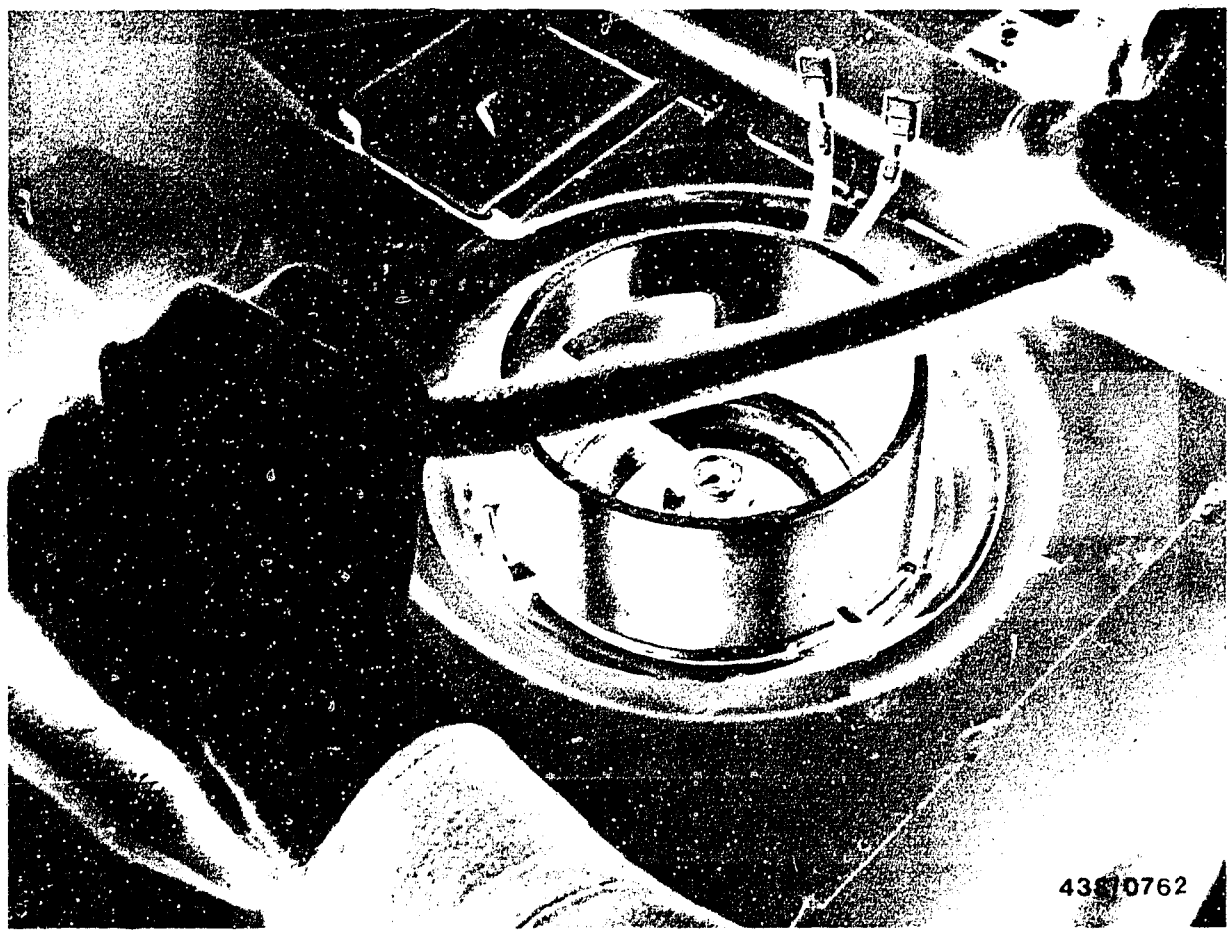
The wider of the holding lugs (1) must be at the front in the direction of travel. Position of electric fuel pump as shown in the illustration.

The suction opening in the intake strainer (2) must be on the right at 90° to the direction of travel.

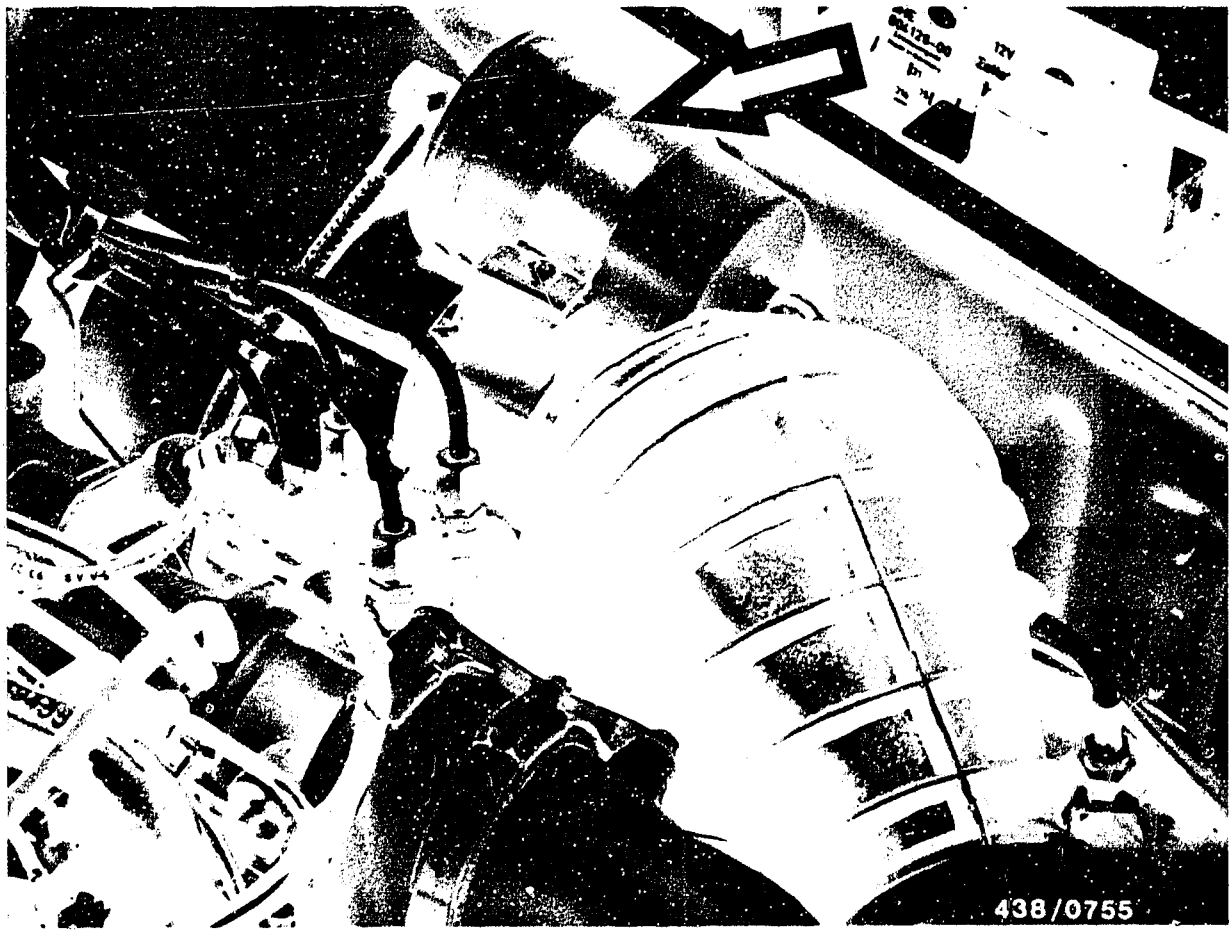


Adjust the overall height of the pump unit to 218 mm and tighten both hose clips.

Installation is only possible in one position due to the wider holding lug.



Tighten the holding plate with the special wrench and connect the fuel line and electric leads.

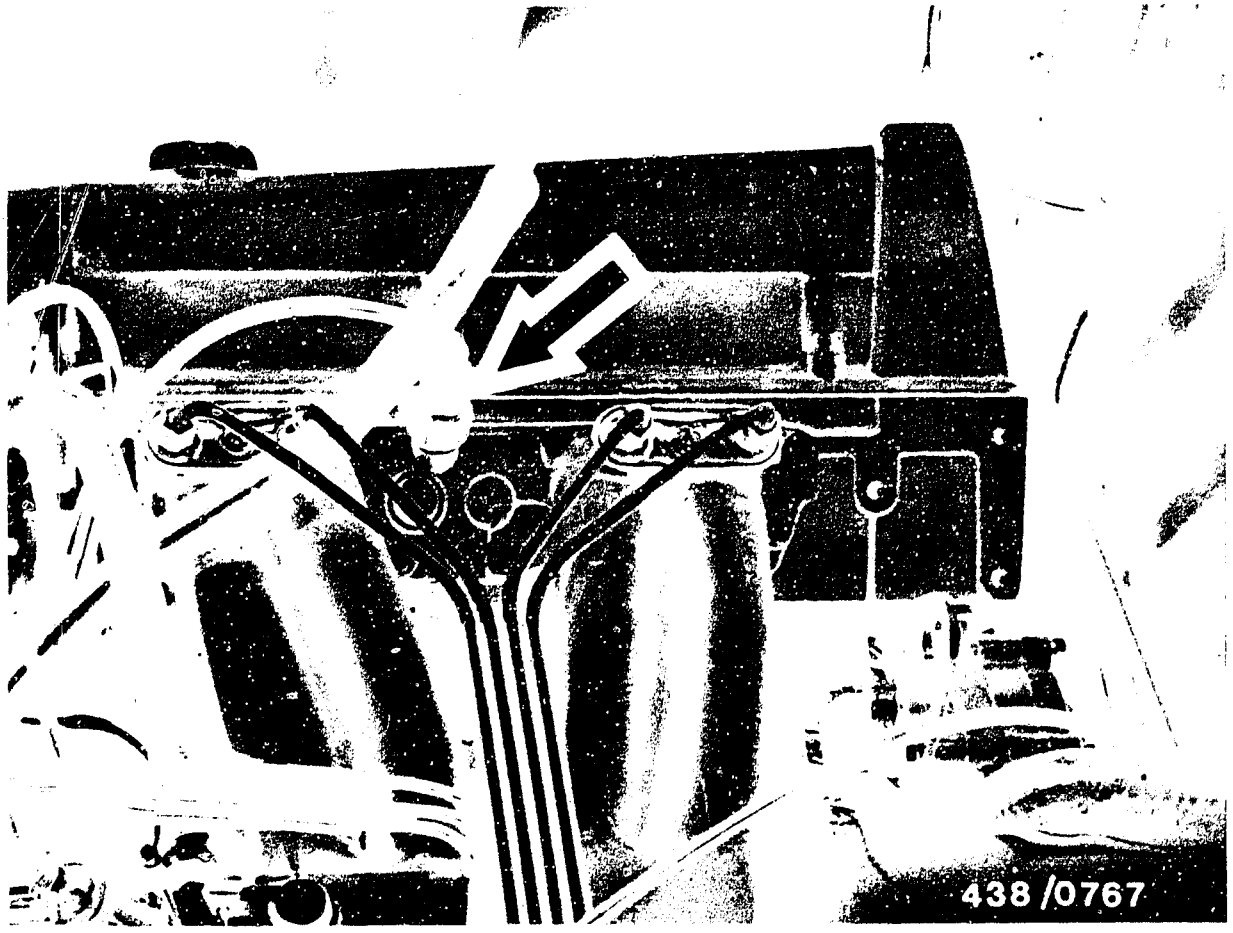


12.8 Removing and installing the fuel filter (arrow):

Unscrew the inlet-union screws of both fuel lines, applying counter-force to the fixed hexagonal section of the fuel filter.

Loosen the fastening clamp and pull out the filter.

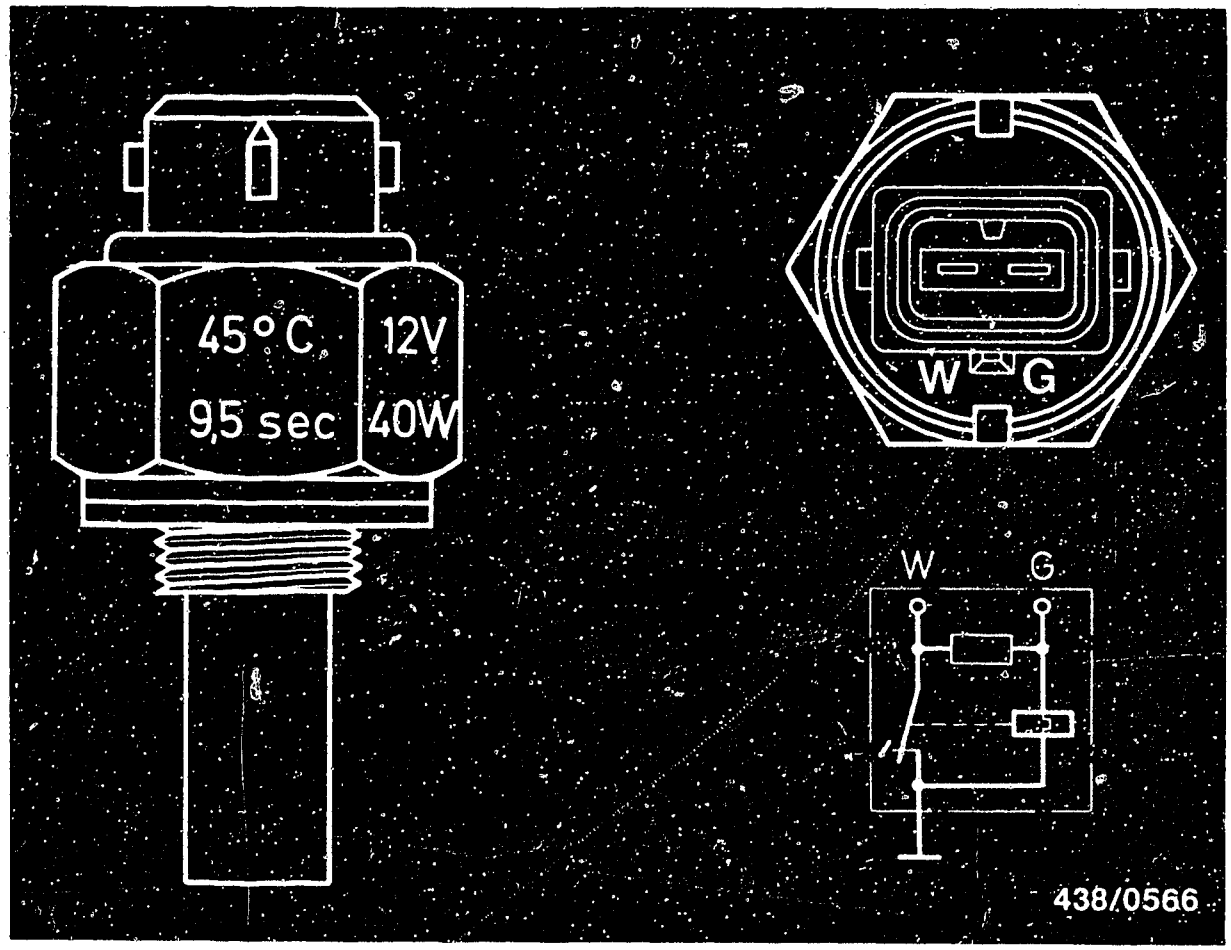
When installing, ensure the correct direction of flow and use new seal rings for the inlet-union screws.



13. CHECKING THE COLD-START SYSTEM (THERMO-TIME SWITCH, COLD-START VALVE)

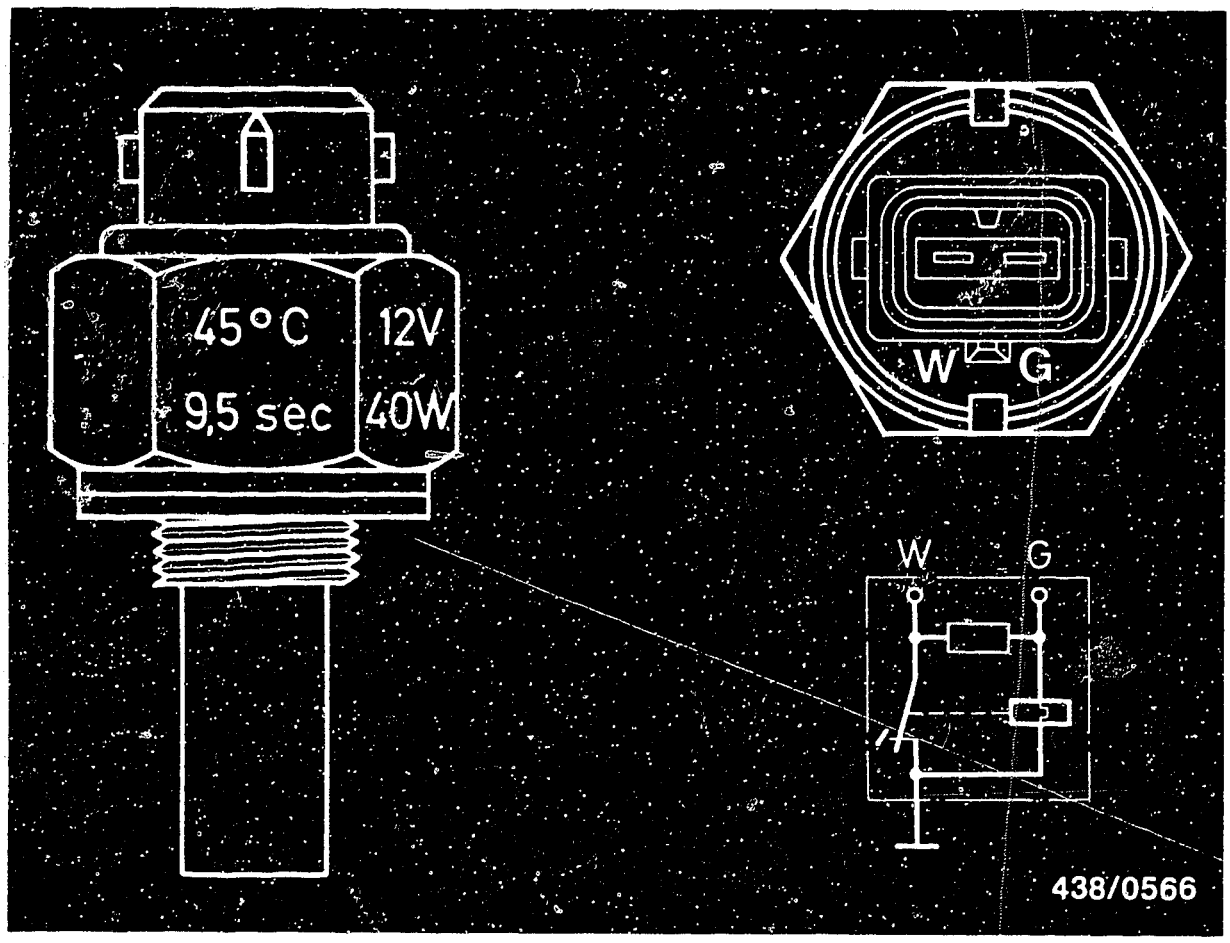
13.1 Thermo-time switch

Remove the thermo-time switch for testing (arrow).



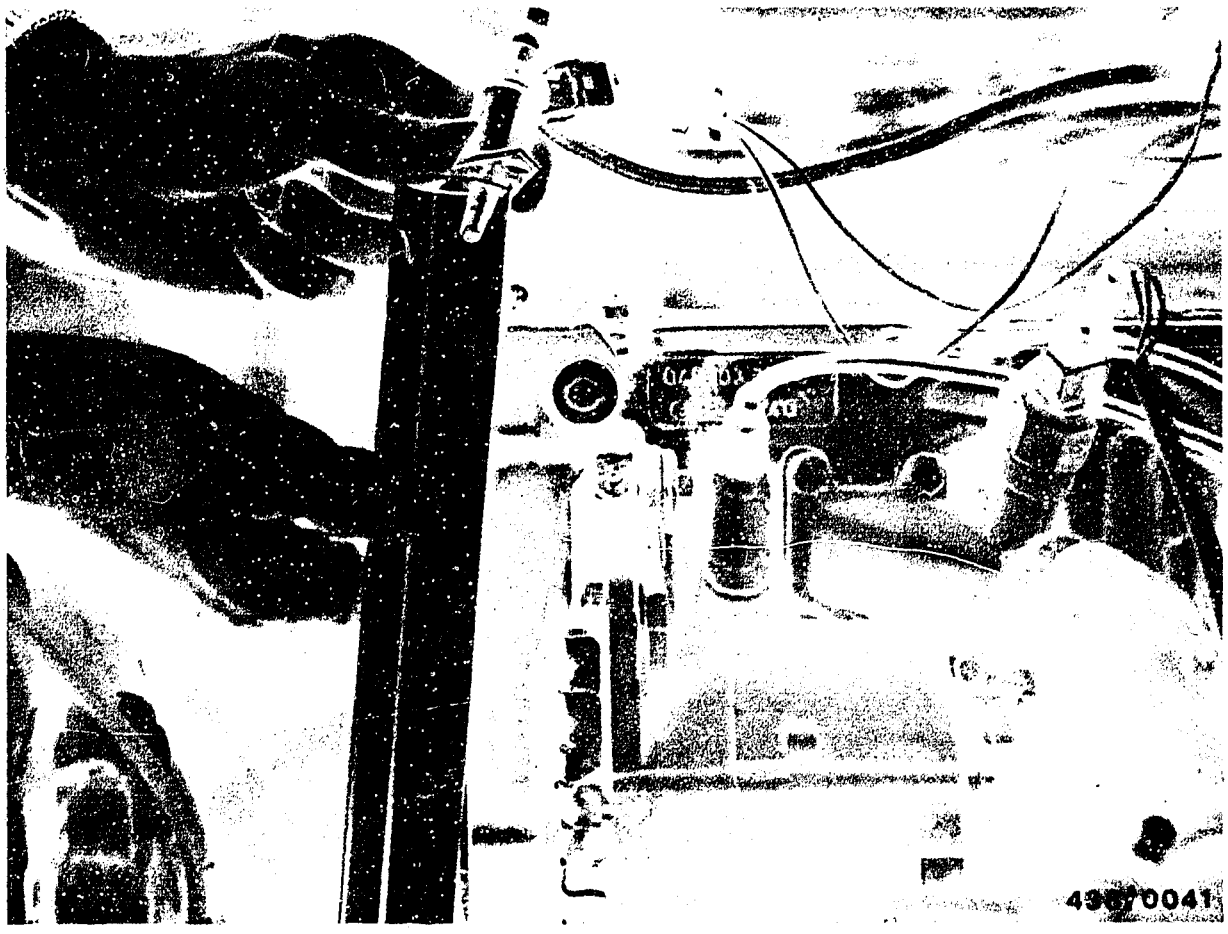
The thermo-time switch used in the Saab has a switching temperature of 45°C and a switching time at -20°C of 9.5 seconds. Both values are stamped on the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below.



The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and "W"
+40		30...40	0	30...40
	+50	55...85	120...160	55...85



13.2 Start valve

Remove the start valve. Hose line remains connected. Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7250/70.

Important note:
During this test, do not let the connecting cable touch B+. Danger of fire due to sparking!

Hold the start valve in a suitable container (e.g. the graduate).
Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates G 1.

14. CHECKING THE CONTROL PRESSURES

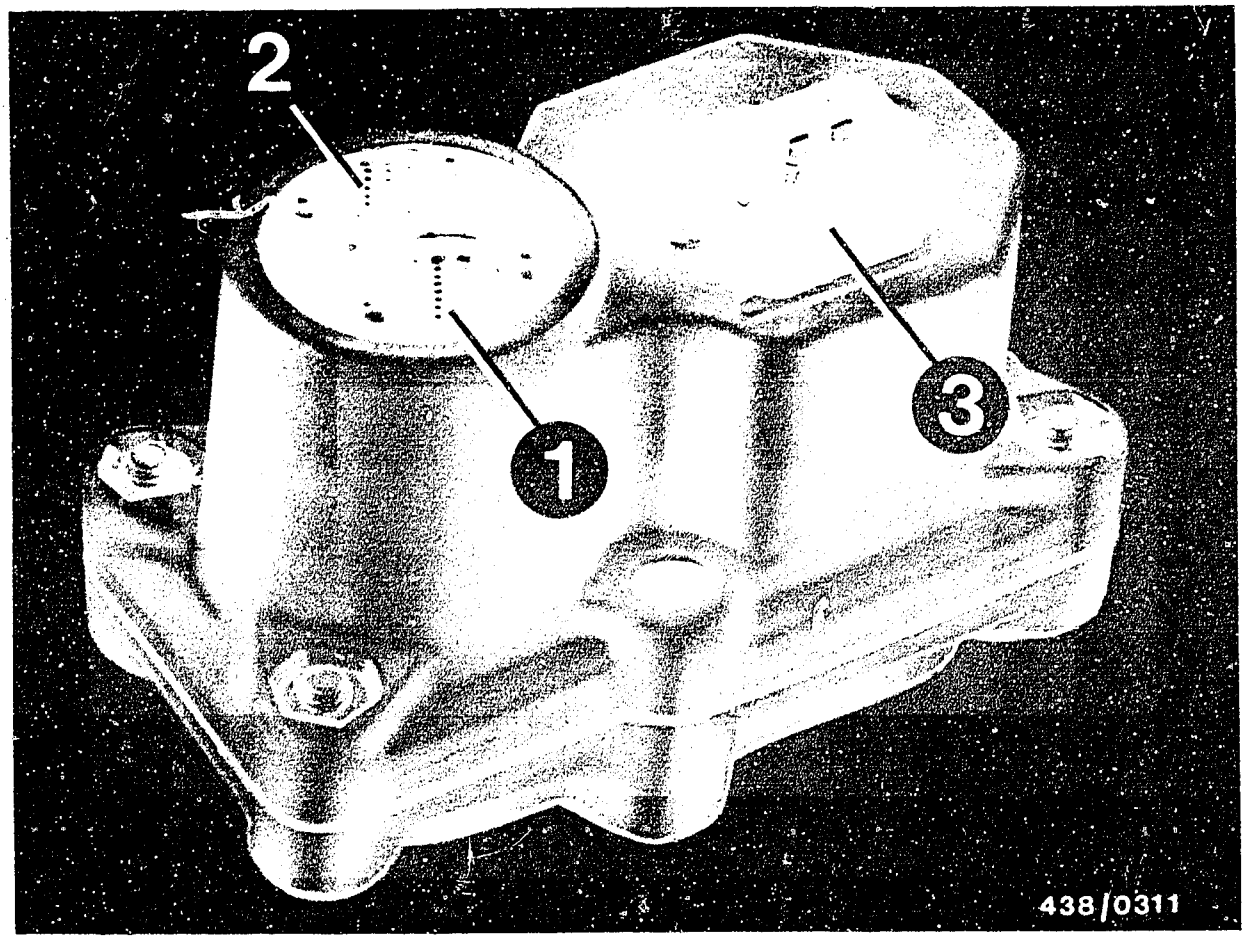
14.1 Preliminary remarks:

The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
Test specification: 160...240 cm^3/min.
Reference is made to the other possible causes of trouble in the respective test step.

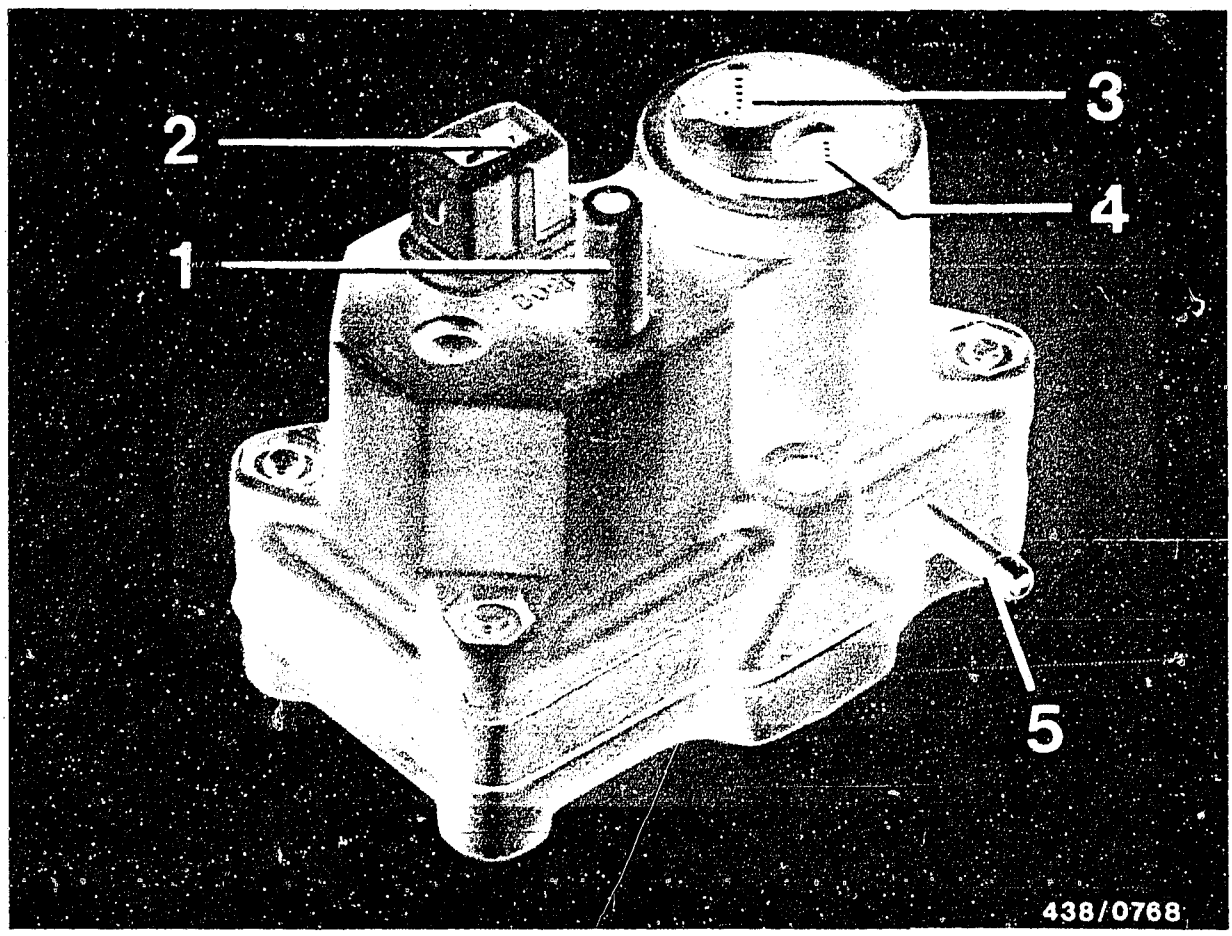


1 = Intake port (M 10 x 1)
2 = Return port (M 8 x 1)
3 = Electrical connection

14.2 Design of warm-up regulator

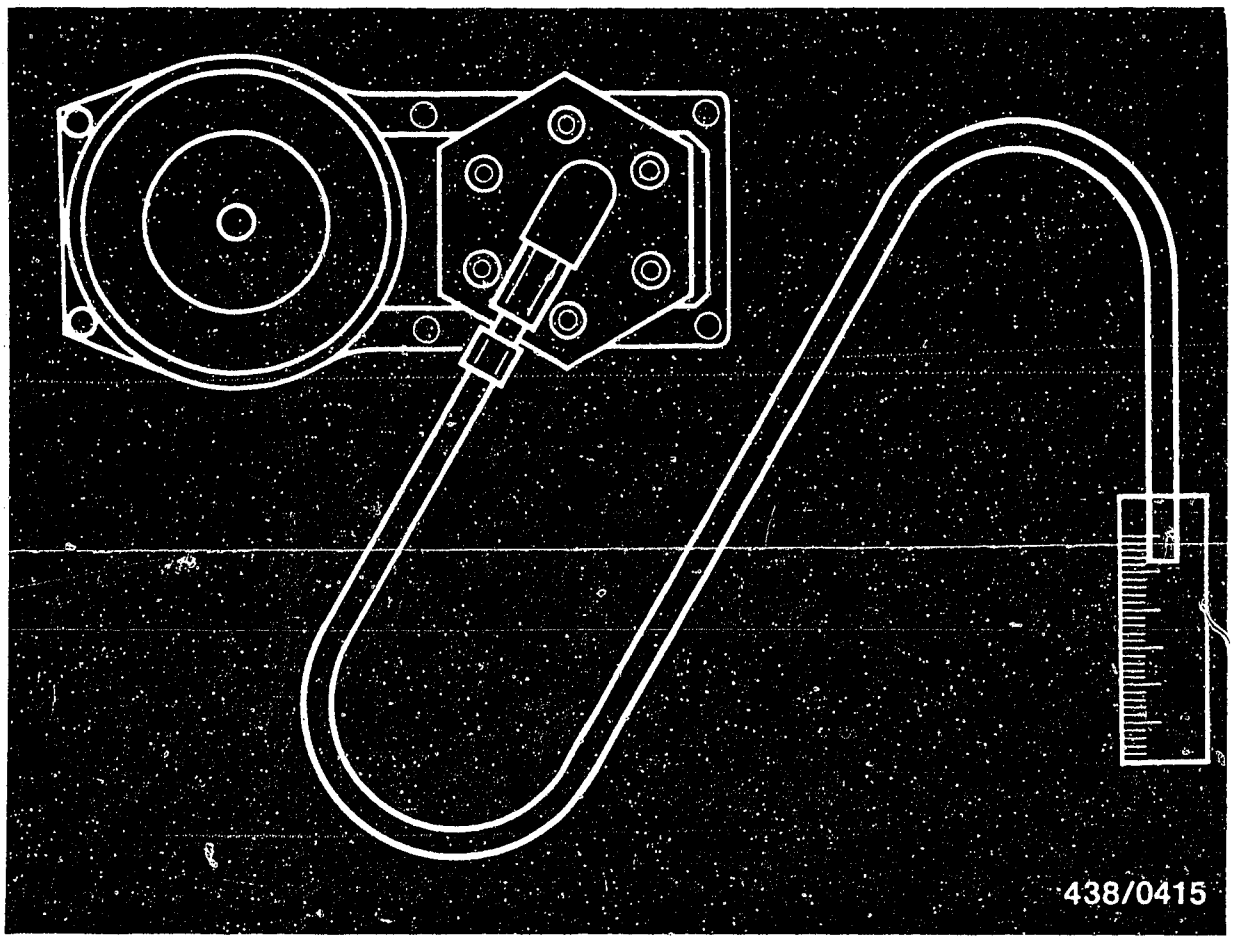
Version on 1978/1979 model:

Warm-up regulator 0 438 140 020
The warm-up regulator corresponds to the standard version, i.e. apart from control pressure "cold" and "warm" no other functions (such as full-load and altitude compensation) are performed.



1 = Atmospheric connection
2 = Electrical connection
3 = Fuel inlet
4 = Fuel return
5 = Intake-manifold-pressure connection; connected in the vehicle to the lateral fitting of the control valve (of the control system).

Version on the 1980/1981 model:
Warm-up regulator 0 438 140 070, ... 085.
The warm-up regulator is a version for charge-air-pressure-dependent full-load enrichment.
The operation of this warm-up regulator is basically the same as that of the known version for intake-manifold-pressure-controlled full-load enrichment.
However, enrichment (control-pressure reduction) does not take place during normal, naturally-aspirated engine operation, but only when there is charge-air pressure (gauge pressure) in the intake manifold.



14.3 Checking the fuel delivery for the control-pressure circuit

Before testing, make sure that the electric fuel pump is operating correctly.

Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor.

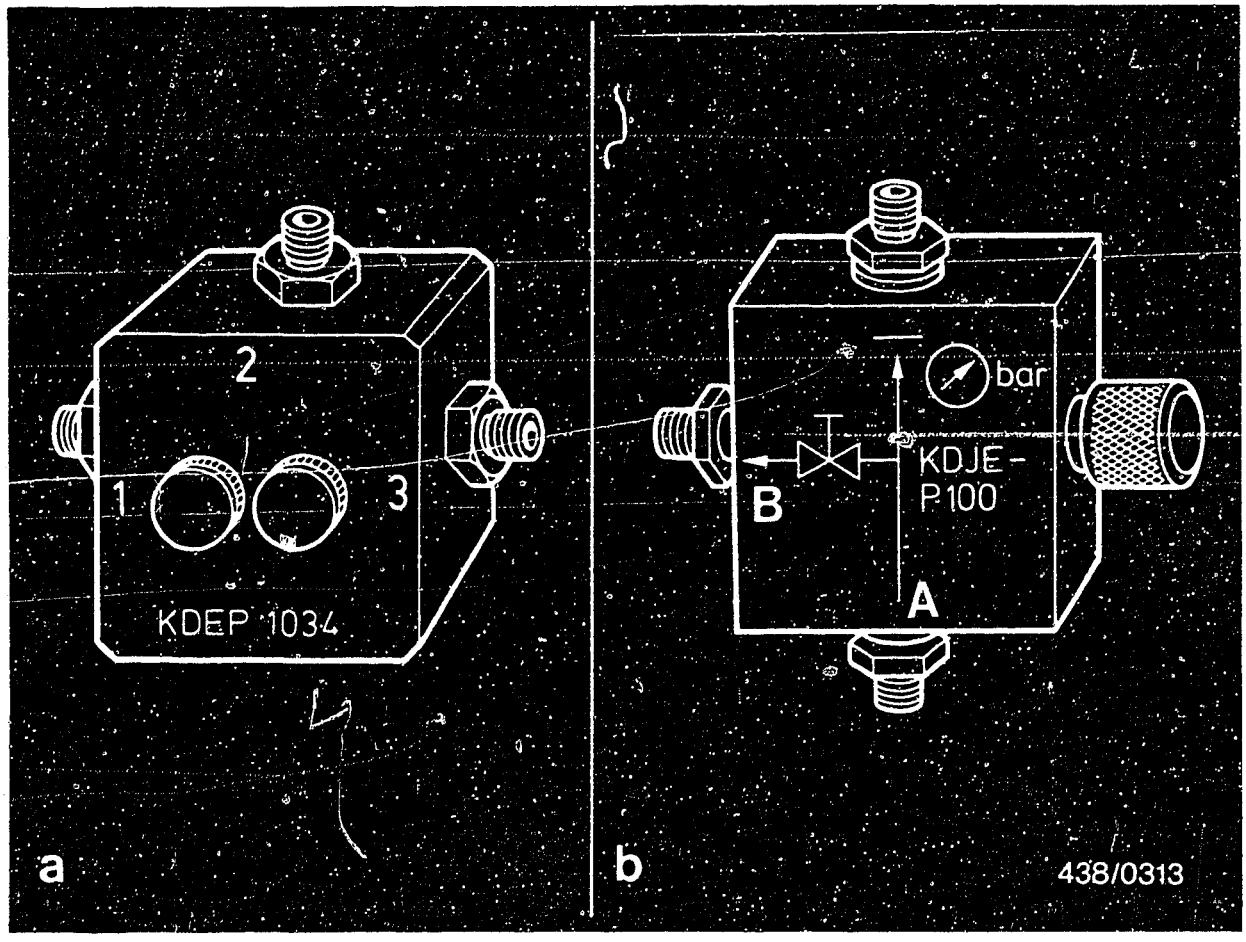
Connect one of the two connecting hoses of the pressure tester KDJE-P 100 (previously KDEP 1034) to the control-pressure port of the fuel distributor (thread M 12 x 1.5) and hold hose in a graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

If the measured value is outside tolerance, the fault is in the fuel distributor.

Replace the fuel distributor.



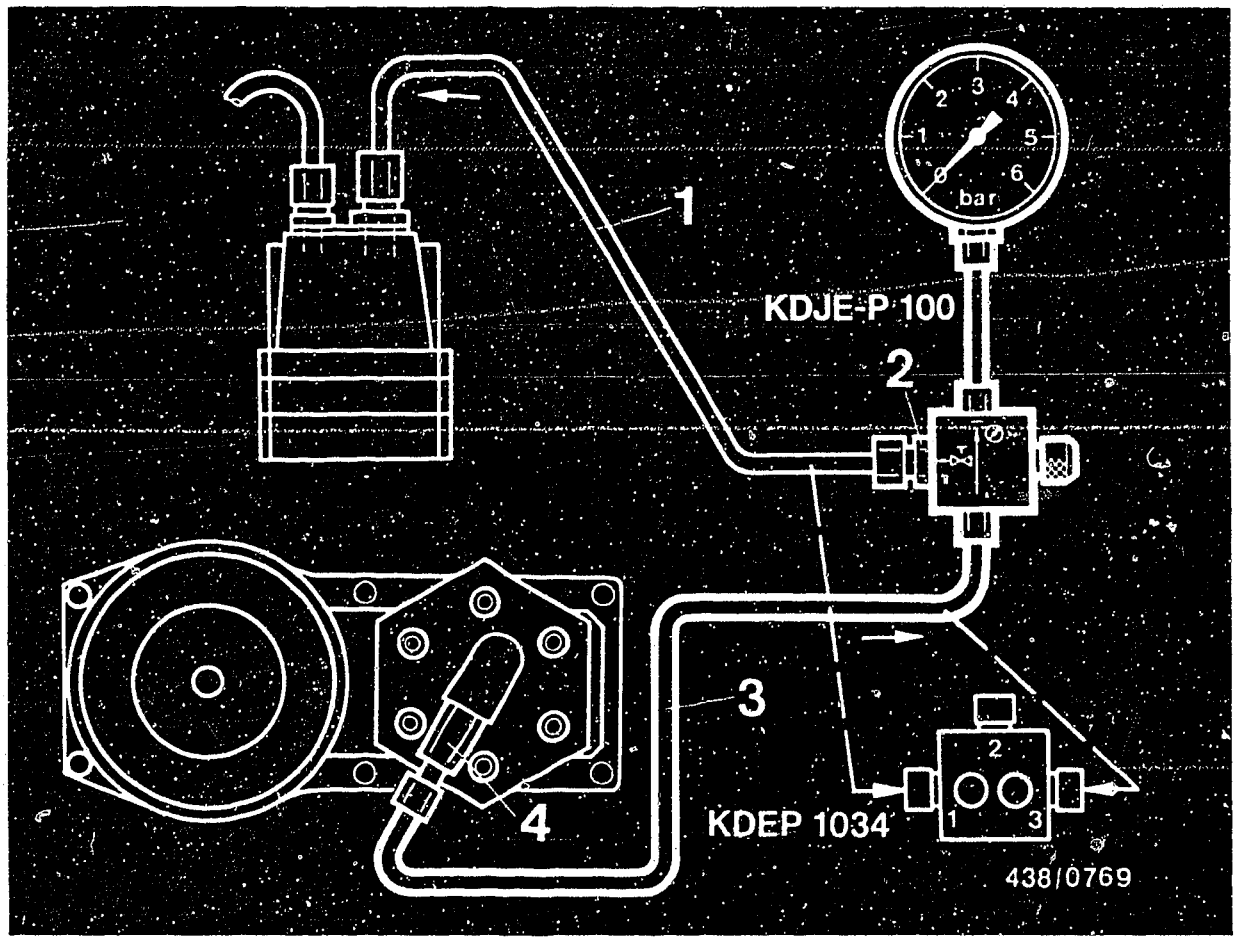
14.4 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

The pressure tester DEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

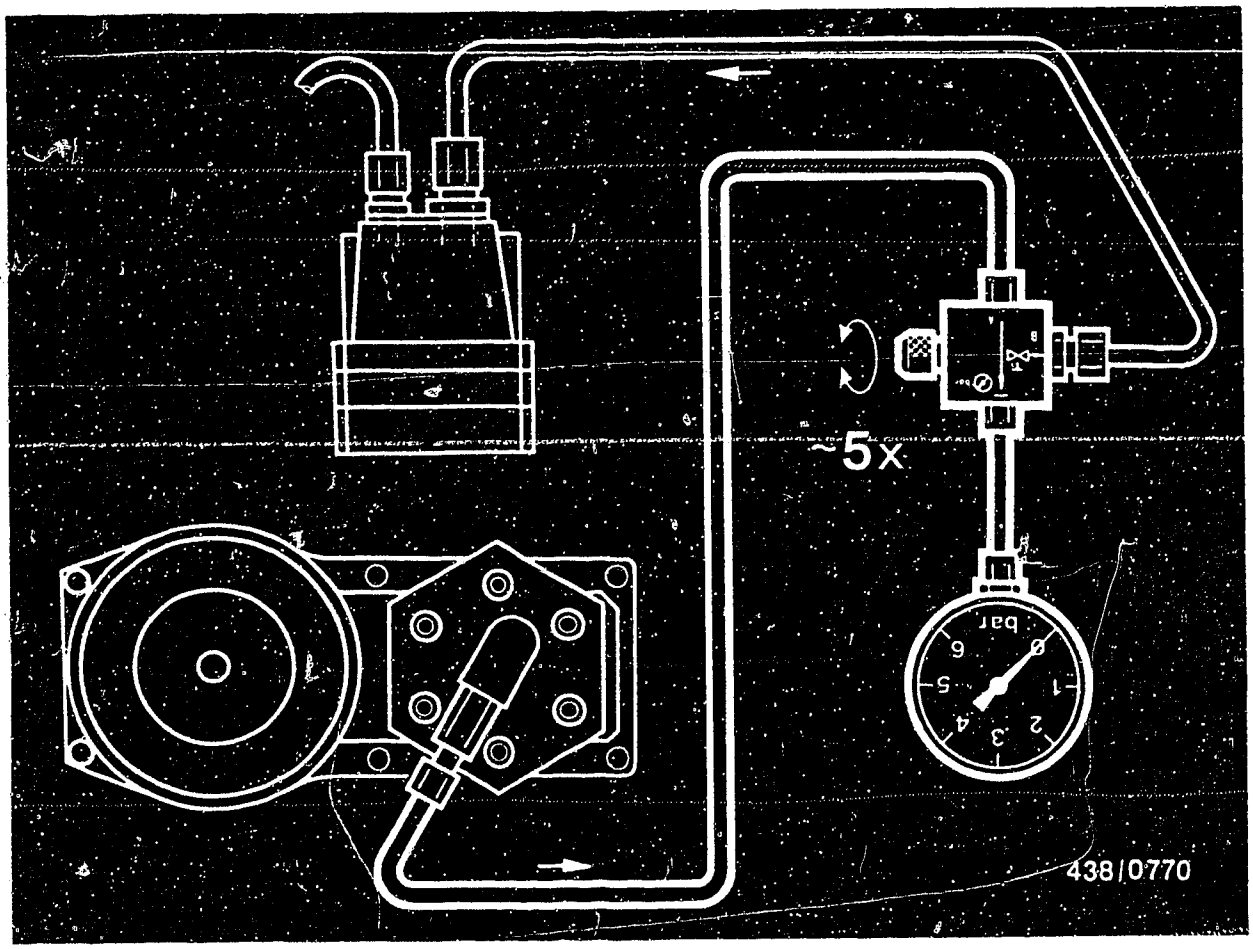
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure port (4) of the fuel distributor.

Suspend the pressure gauge from the engine-compartment lid (possibly using a wire hook).



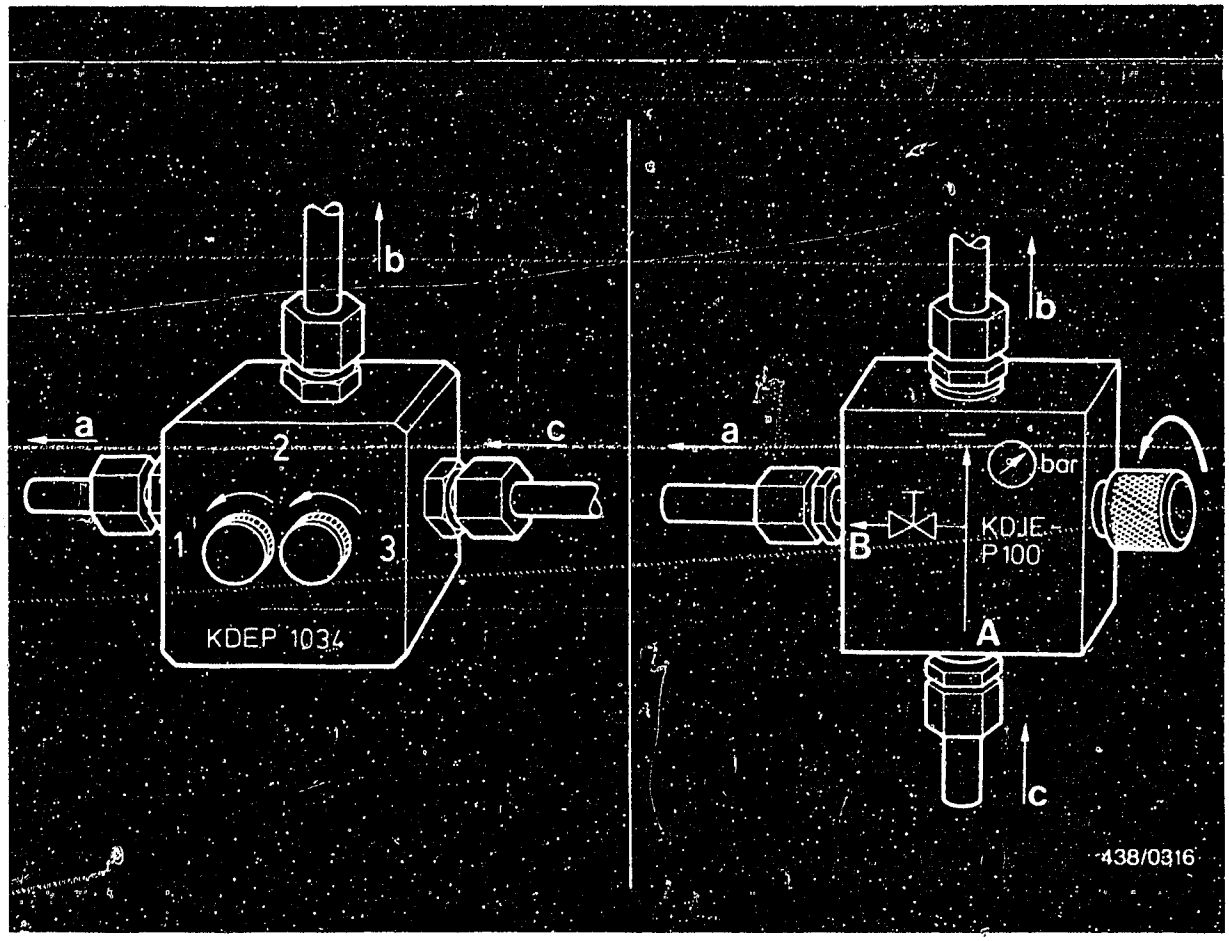
14.5 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and auxiliary-air device.

Let the pressure gauge hang down (hose fully extended). Switch on the electric fuel pump by bridging the electrical safety circuit:

Open and close the valve screw of the directional-control valve (in the case of KDEP 1034, valve screw 1) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

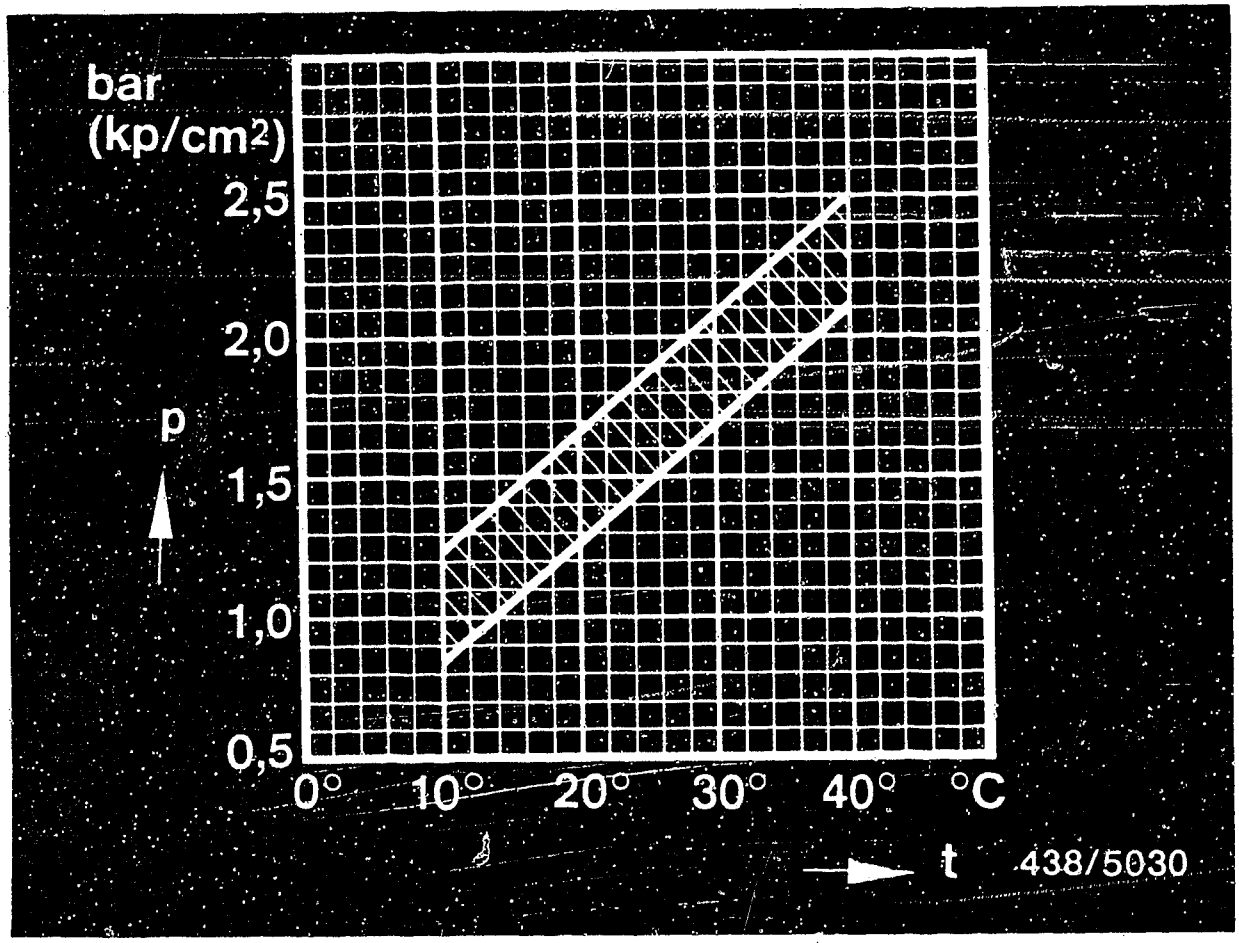
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.6 Testing the "cold" control pressure:

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Remove the hose line from the intake-manifold-pressure connection port of the warm-up regulator.
Switch on the electric fuel pump by bridging the electrical safety circuit.



p = Control pressure
t = Ambient temperature

Part number of warm-up regulator:
0 438 140 020 (model 78/79 Europe, basic version, without additional function)

---

0 438 140 070 (model 80 Europe)
0 438 140 085 (model 81 Europe)
Versions for charge-air-pressure-dependent full-load enrichment. Test without intake-manifold pressure

Calculate the nominal control pressure in accordance with the ambient temperature in the graph.

Example: ambient temperature = 20°C
nominal control pressure = 1.25 ... 1.65 bar (Gauge pressure)

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.
  Test value: 160...240 cm^3/min.

- Fuel return from warm-up regulator blocked or constricted (if control pressure too high).
  Eliminate restriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has failed due to fouling, the new warm-up regulator must be provided with tube fitting 1 433 356 802. Tightening torque 20...22 Nm (2.0...2.2 kgfm).

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

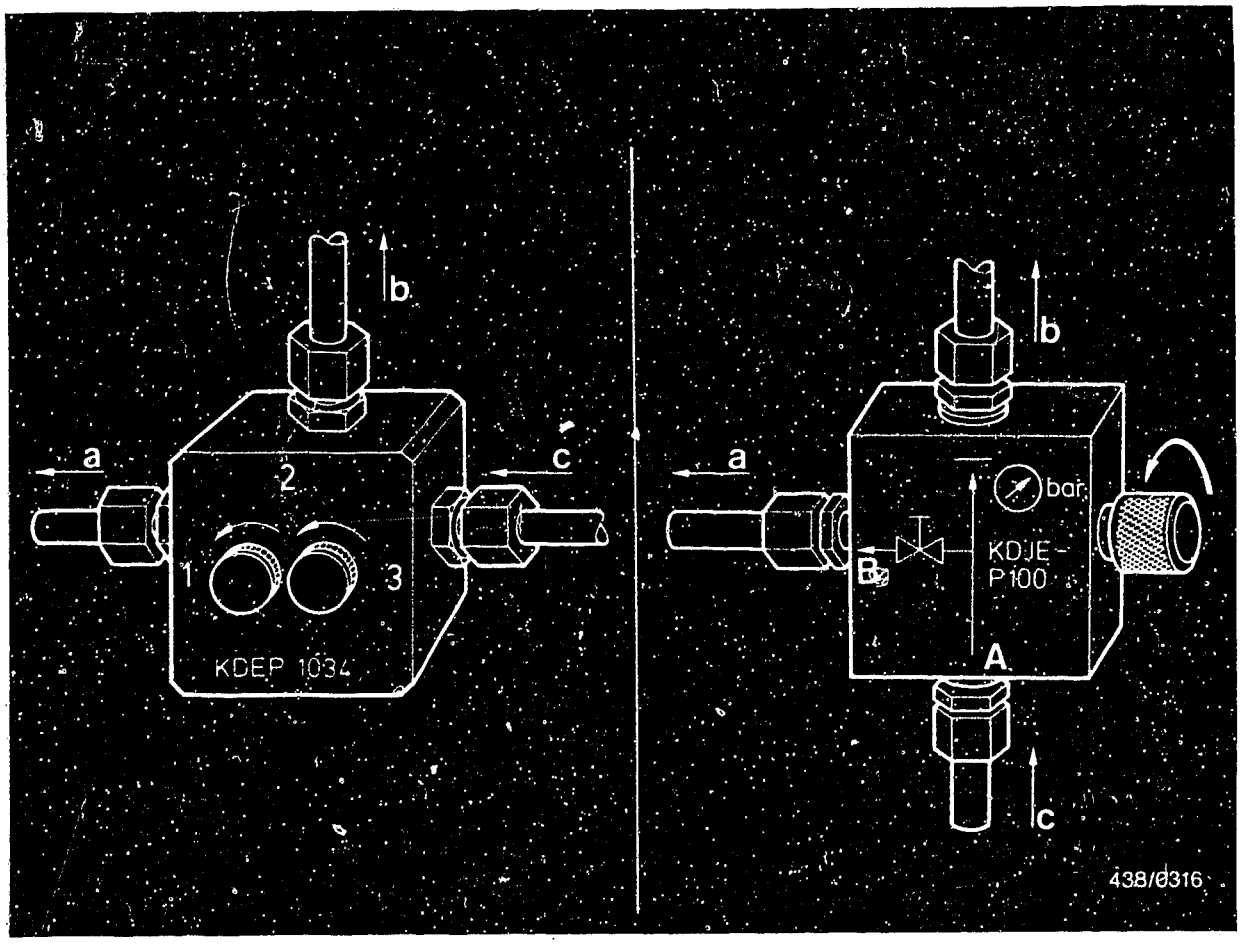
Idle adjustment is described on Coordinate G 1.

Note:

The above-described control-pressure test indicates whether the control-pressure circuit and the warm-up regulator are OK.

Incorrect control-pressure functions during vehicle operation can, however, also be due to a malfunction in the intake-manifold-pressure control system for the warm-up regulator.

This system must be tested with the engine running and at normal operating temperature. It is, therefore, practical to combine this test with the final idle adjustment. Idle adjustment is described on Coordinates G 1.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.8 Testing the "warm" control pressure

14.8.1 Part number of warm-up regulator 0 438 140 020
Model 78/79 Europe.
Basic version, without additional function.
The test is performed with the engine switched off, without intake-manifold-pressure.
The temperature of the engine is not important.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test specifications for "warm" control pressure: 3.4...3.8 bar gauge pressure (3.5...3.9 kgf/cm^2 gauge pressure)

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted. Eliminate construction.

- Warm-up regulator has hydraulic defect.
  Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.
  Eliminate open circuit. Ensure that the plug is contacting properly.

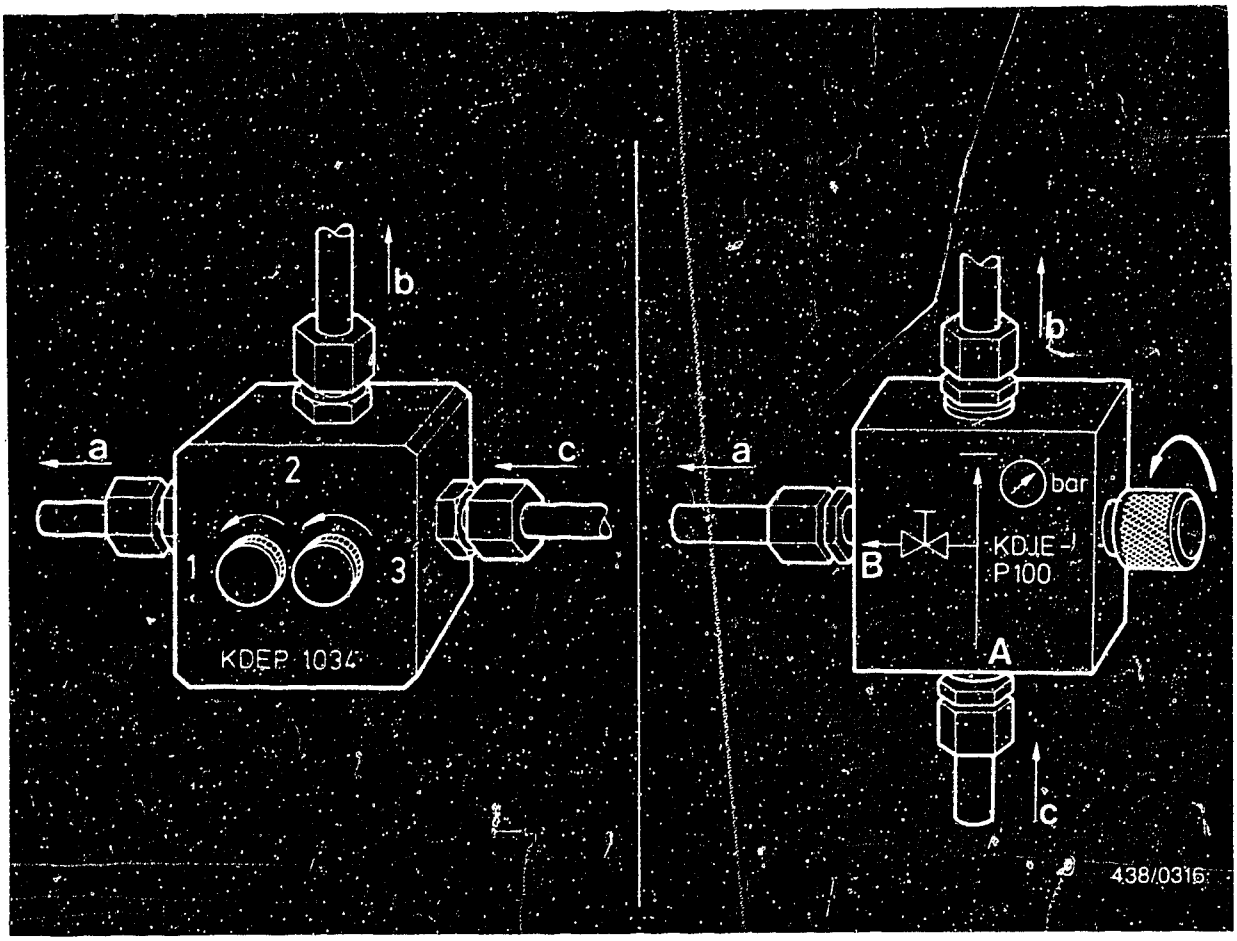
- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.

When the warm-up regulator has been replaced,or when a defect has been remedied, the idle speed is to be set finally with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 1.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.8.2 Part number of warm-up regulator:
0 438 140 070 (model 80 Europe)
0 438 140 085 (model 81 Europe)

Versions for charge-air-pressure-dependent full-load enrichment.

The test is performed with the engine stationary, once without charge-air pressure, and once with simulated charge-air pressure.

Test procedure:

Engine temperature not important.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit:
Attach the plug to the warm-up regulator.
Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached without charge-air pressure.

Test specification:

"Warm" control pressure
without charge-air pressure: 3.4...3.8 bar (3.5...3.9 kgf/cm^2).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
  Test fuel delivery.
  Nominal value = 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted.
  Eliminate constriction.

- Warm-up regulator has hydraulic defect.
  Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.

Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.

Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.

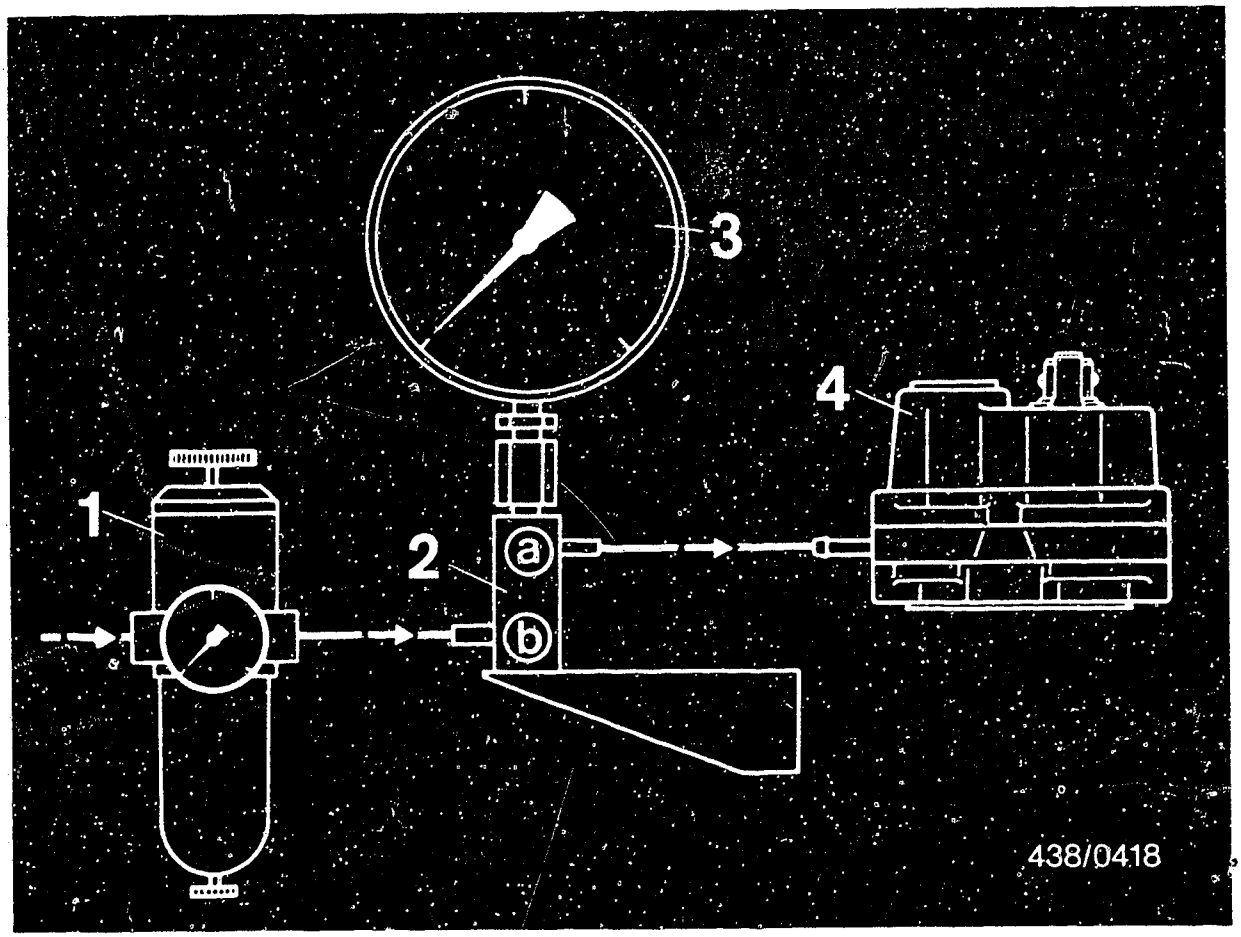
Test fuel delivery.
Nominal value = 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit
  Hydraulic defect

- Replace warm-up regulator.

If the warm-up regulator has been replaced or a defect has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinate G 1.

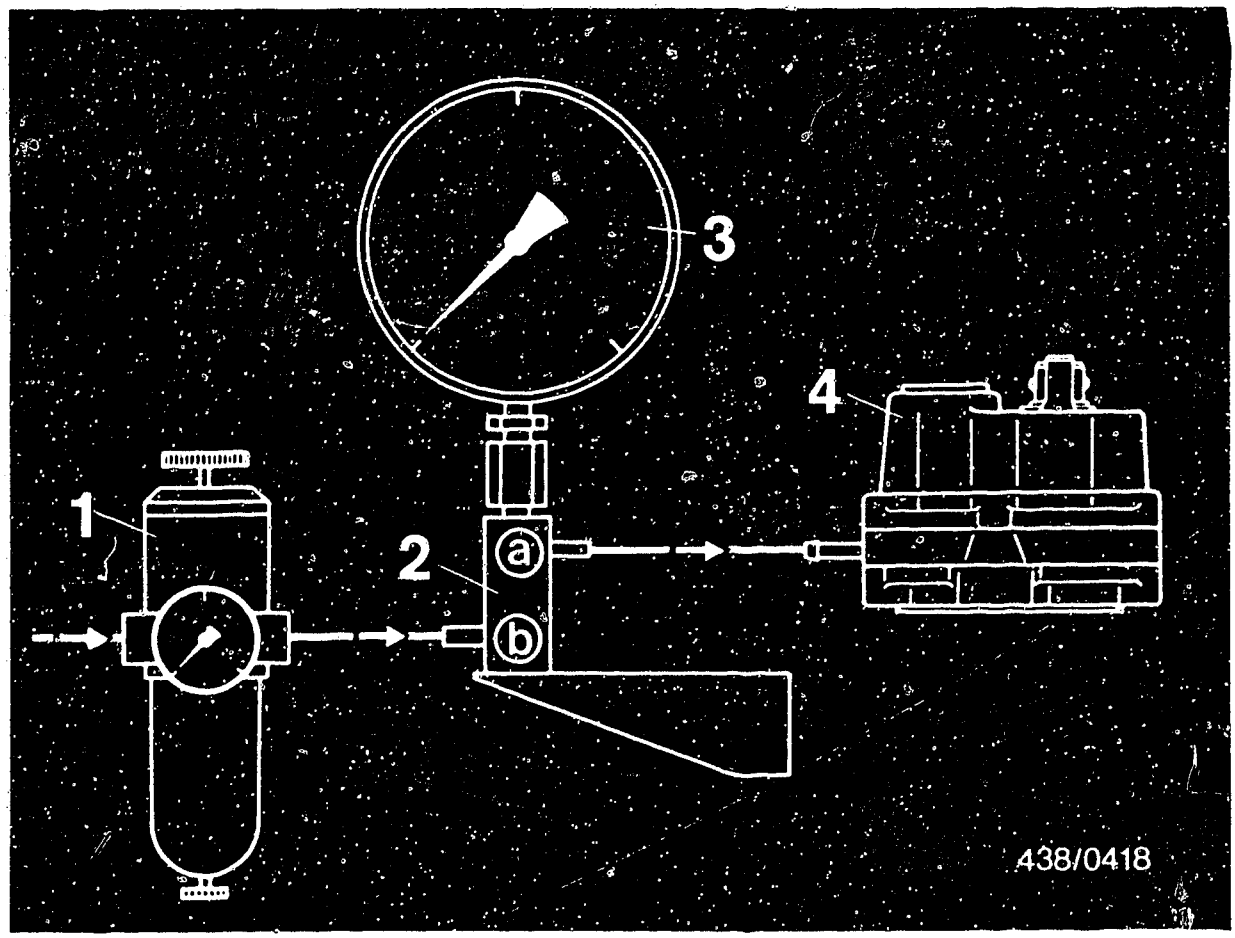


In order to check the full-load control pressure, atmospheric pressure according to the charge-air pressure must be applied to the warm-up regulator.

Pressure is applied via the compressed-air network. The following are required for this:

1 compressed-air reduction valve (1) with pressure gauge 0...4 bar gauge pressure (commercially available, e.g. from Krais and Fritz, Stuttgart, Type No. 104).
1 regulator (2) Bosch 0 688 130 132.
In addition a pressure gauge (3) 0...1.6 bar guage pressure, quality class 1.0 (commercially available, e.g. Wika No. 4184).

Note:
This equipment is often already available in the diesel workshop and is used there for checking the manifold-pressure compensators on diesel fuel-injection pumps.



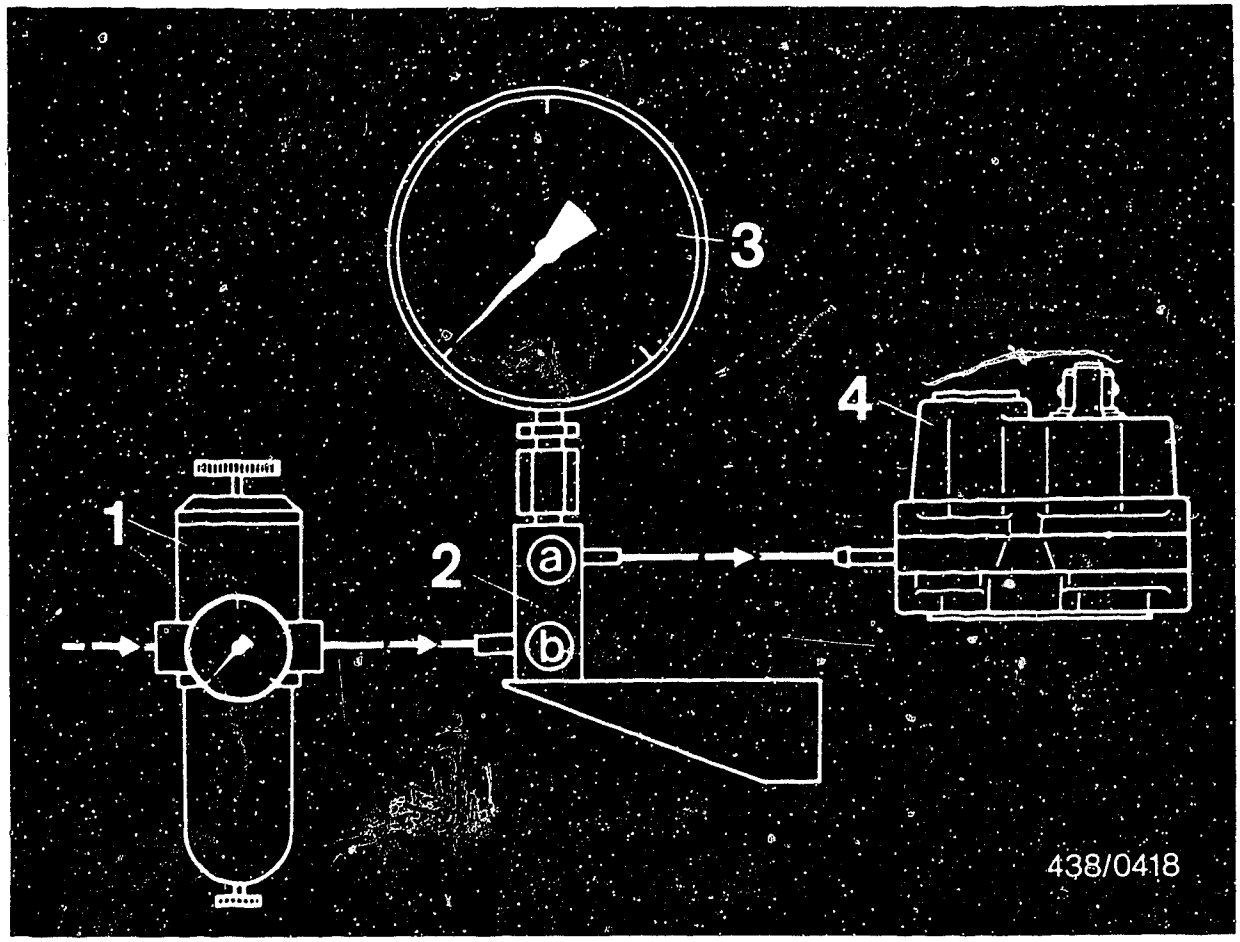
Test procedure for full-load control pressure:

The electric fuel pump remains switched on, the electrical connector on the warm-up regulator remains in position.

Test specification:

Testing with simulated charge-air pressure (gauge pressure):

Charge-air pressure:	Control pressure:
650...750 mbar	2,4...2,8 bar
(490...565 mm Hg)	(2,5...2,9 kgf/cm²)



1 = Pressure regulator
2 = Adjustment throttle
3 = Pressure gauge
4 = Warm-up regulator

Set the pressure to max. 0.8 bar gauge pressure at the pressure regulator (1).

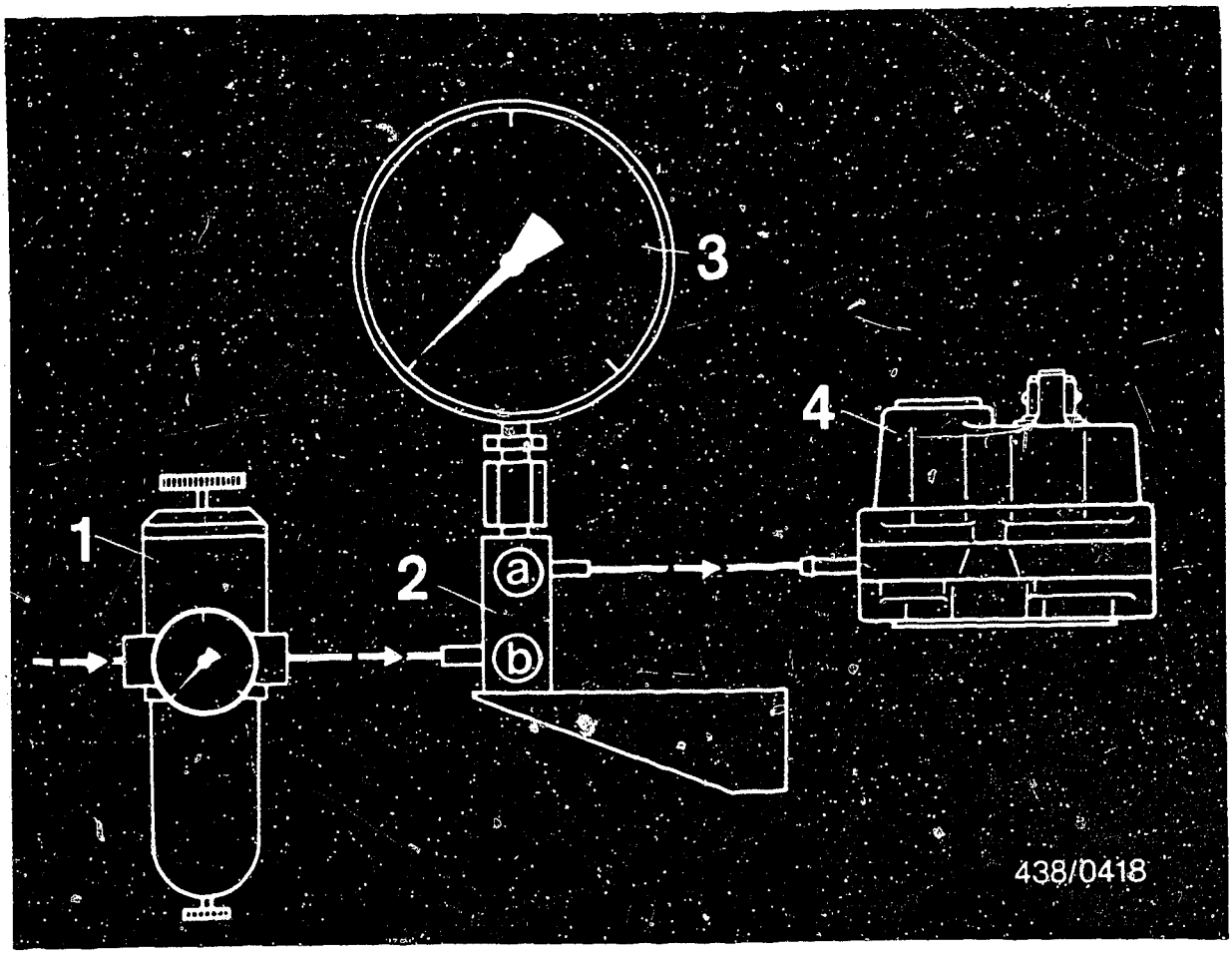
Make a connection from the upper connection port of the adjustment throttle (2) to the warm-up regulator (4).

Open the screw plug (a) of the adjustment throttle. Using the adjusting screw (b) set the charge-air pressure in accordance with the test specification. The control pressure must drop to the value "with charge-air pressure".
If this is not the case, replace the warm-up regulator.

Note:
The above-described control-pressure test indicates whether the control-pressure circuit and the warm-up regulator are OK.

Incorrect control-pressure functions during vehicle operation can, however, also be due to a malfunction in the intake-manifold-pressure control system for the warm-up regulator.

This system must be tested with the engine running and at normal operating temperature. It is, therefore, practical to combine this test with the final idle adjustment. Idle adjustment is described on Coordinates G 1.



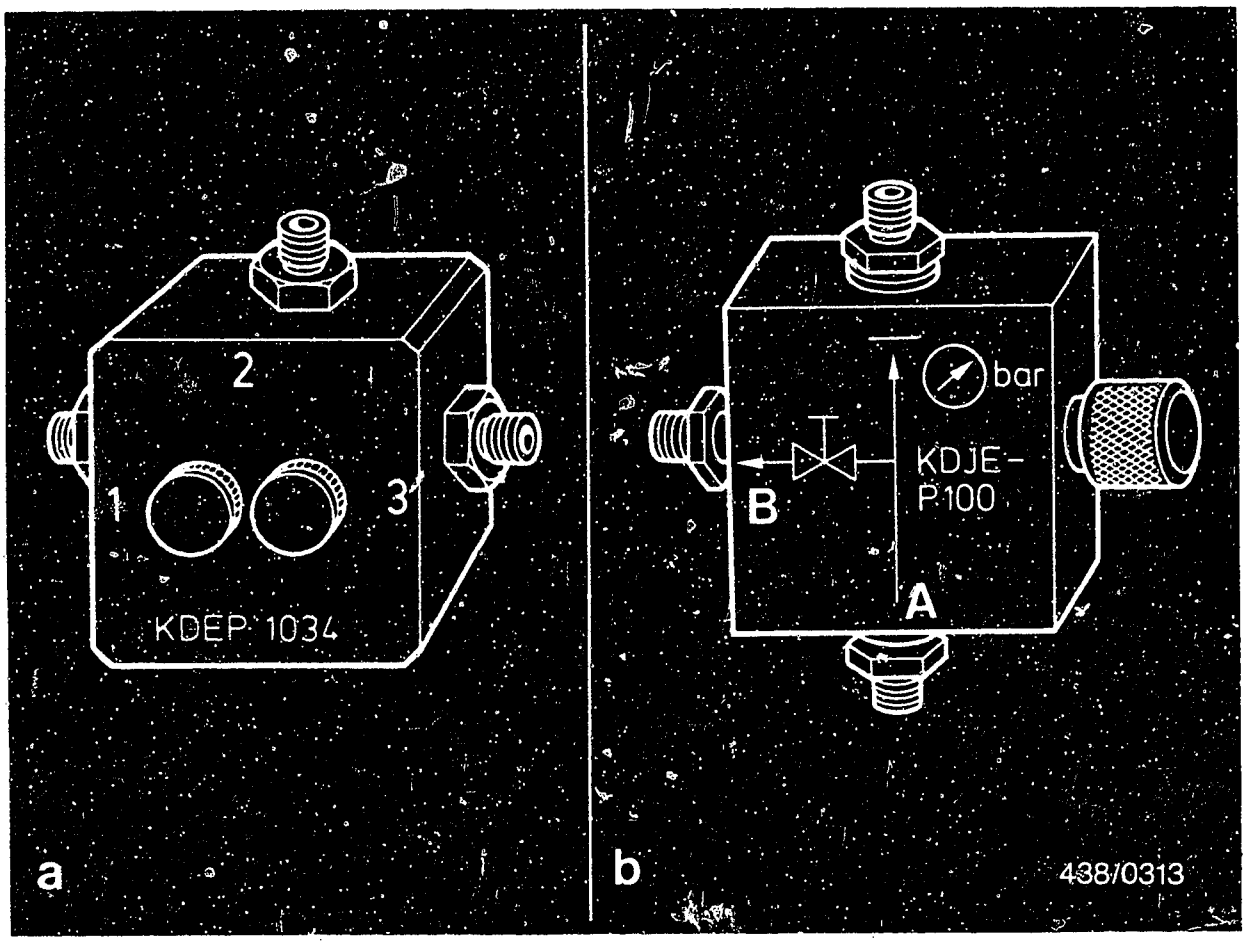
14.9 Testing the full-load diaphragm in the warm-up regulator for leaks:

Test specification:

Test pressure: 600 mbar (450 mm Hg)
Reduction in pressure: max. 66 mbar (50 mm Hg)/15 s

Switch off the electric fuel pump.
Adjust the test pressure according to the test specification by adjusting screw (b).
Close the screw plug (a) and check the reduction in pressure.
If the leakage is too great, replace the warm-up regulator.

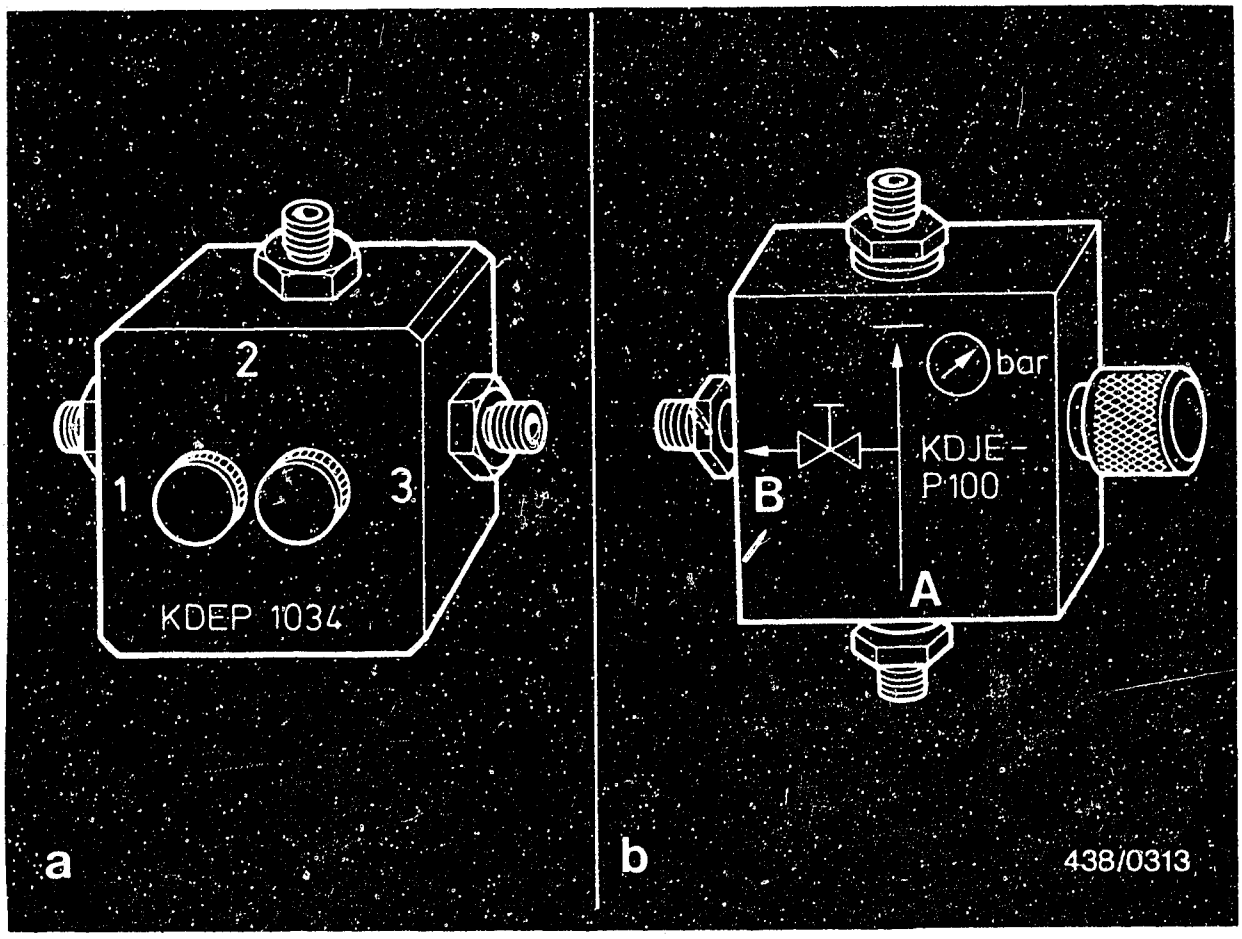
Caution: When troubleshooting, always test the full-load control pressure and check the full-load diaphragm for leaks. Engine damage can occur if there is no or very little full-load enrichment.



15. TESTING AND ADJUSTING THE PRIMARY (SYSTEM) PRESSURE:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

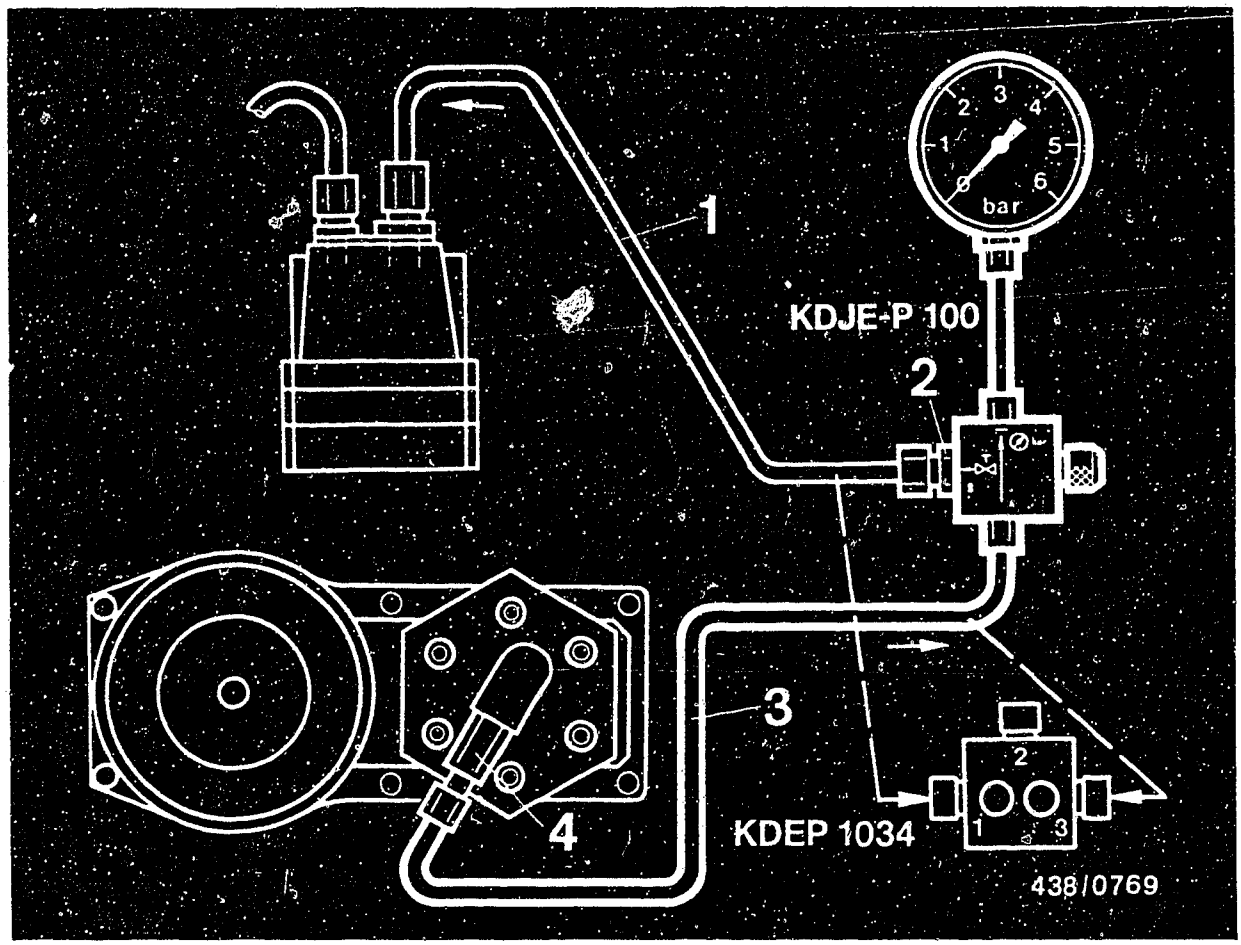


Since the end of 1979 the pressure rester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

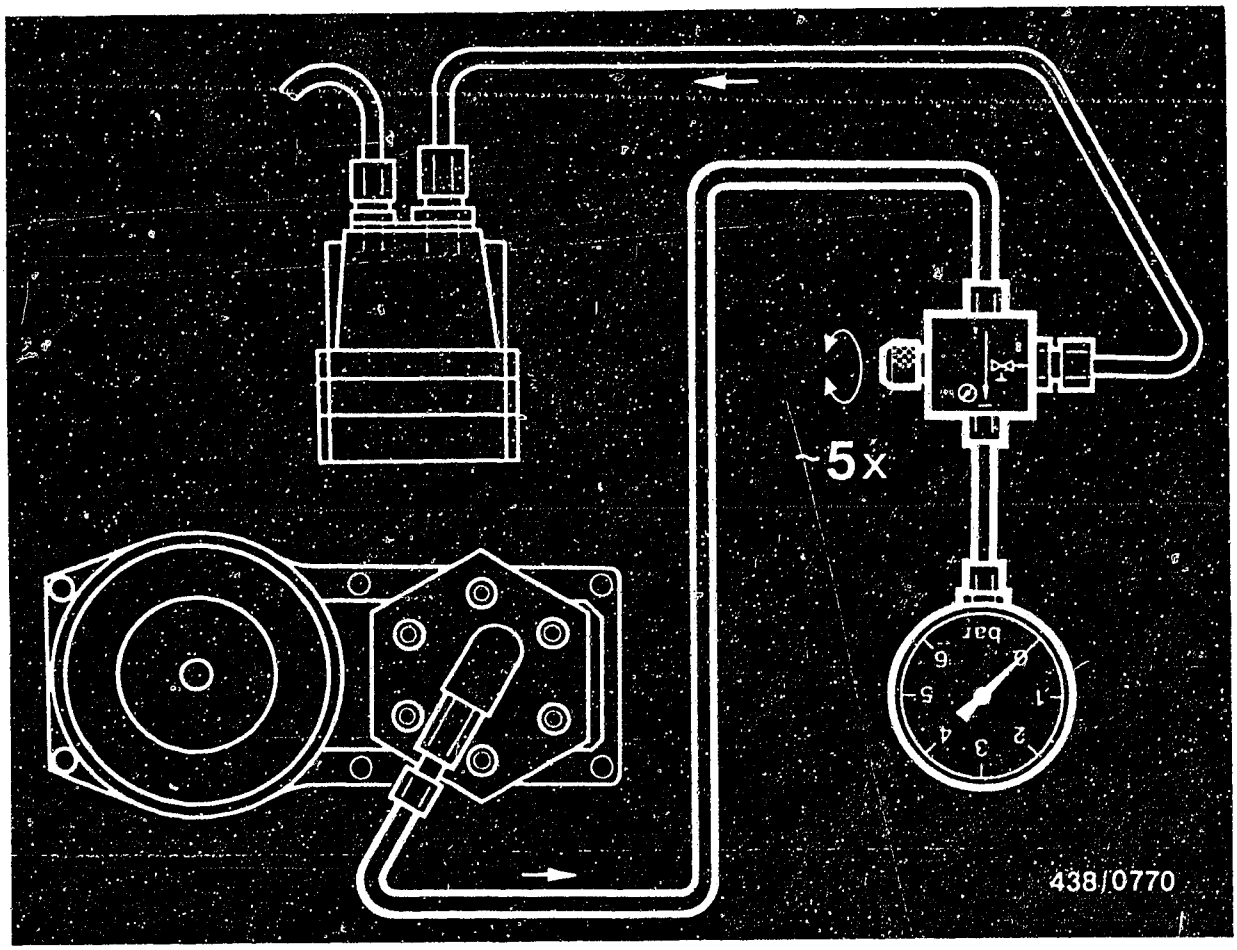
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure port (4) of the fuel distributor.

Suspend the pressure gauge from the engine-compartment lid (possibly using a wire hook).



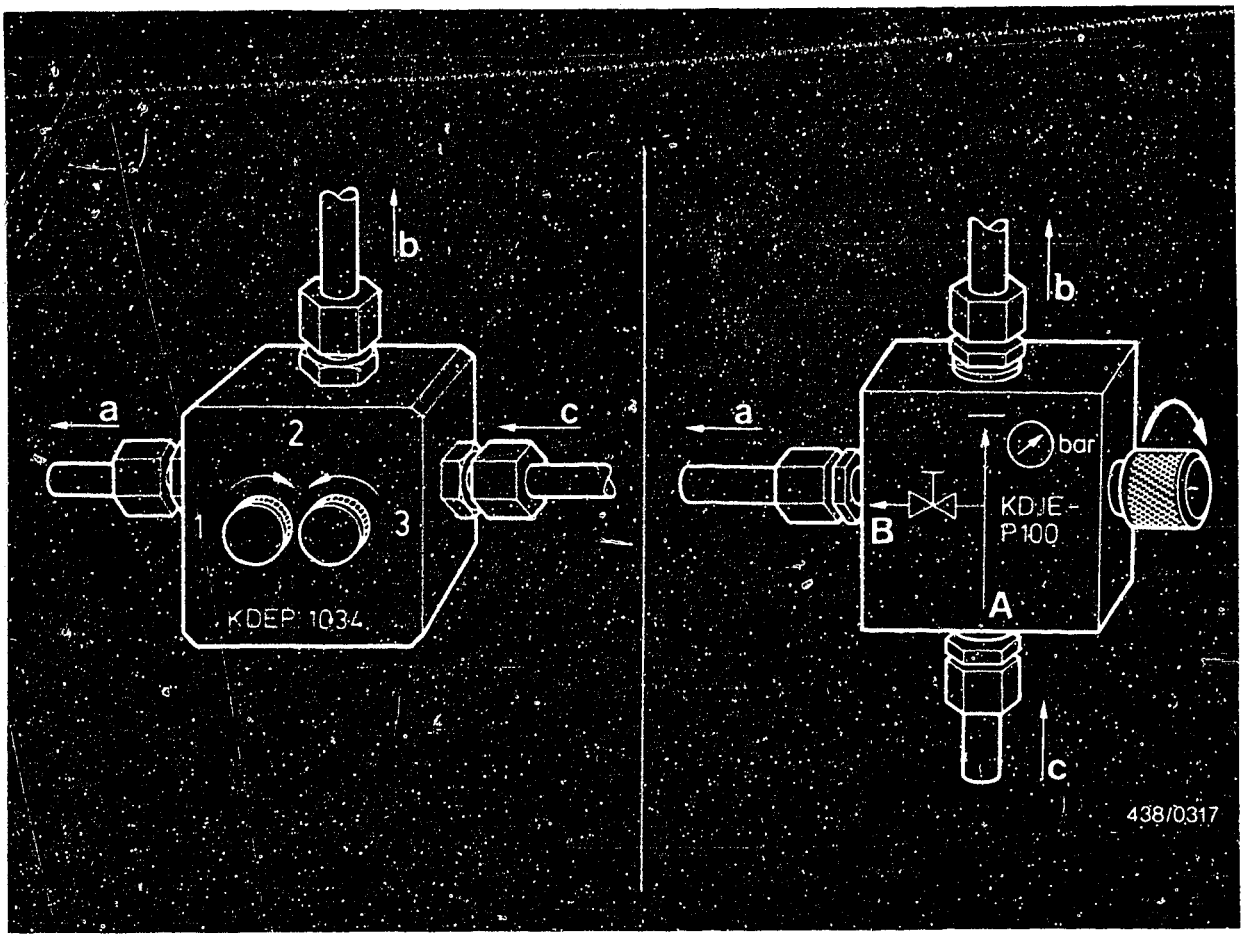
15.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator and from the auxiliary-air device. Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure

The test is performed with the engine switched off. The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.
The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - Primary pressure (gauge pressure)
0 438 100 045 0 438 100 057	5,2...5.8 bar (5,3...5.9 kgf/cm²)

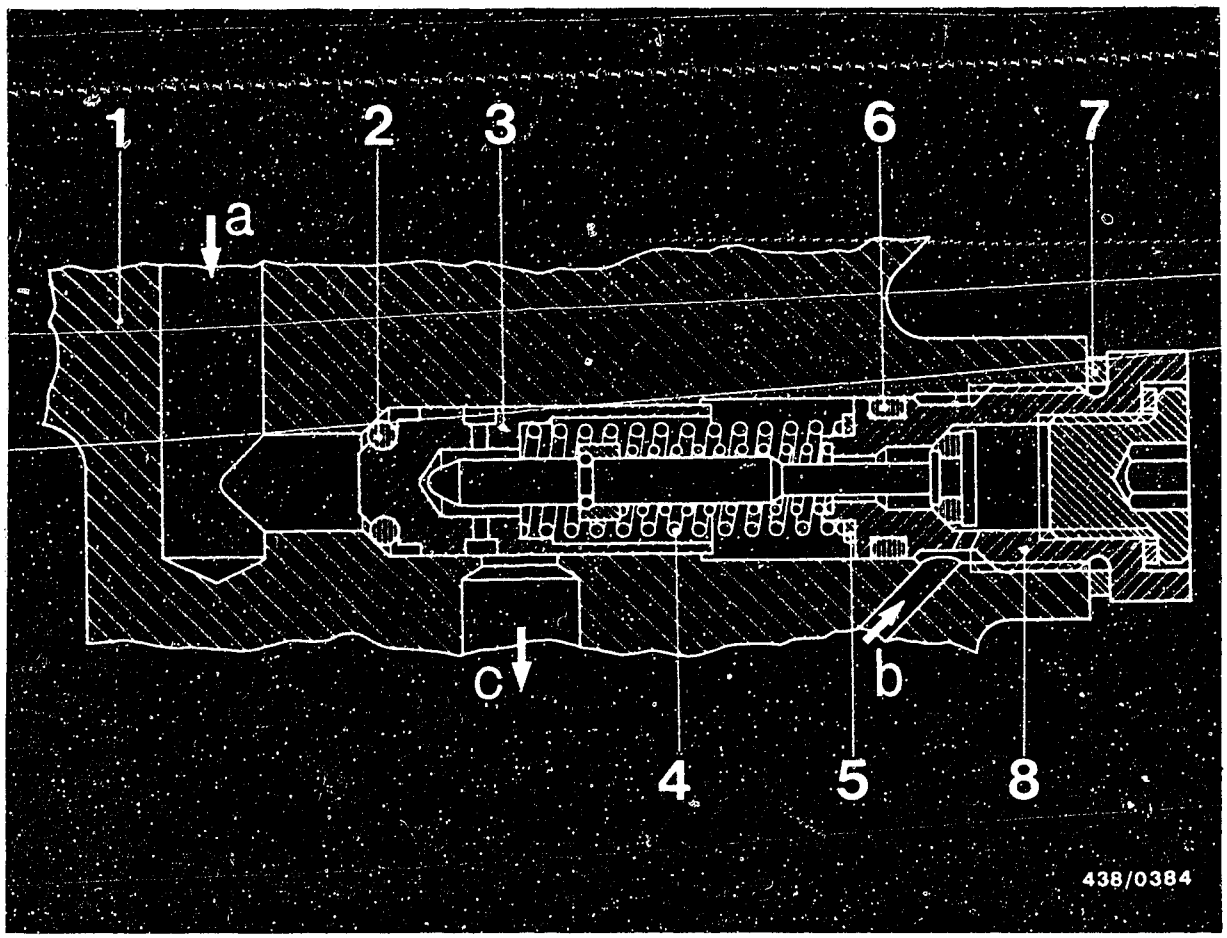
Possible causes for too low a primary pressure:

- Fuel supply faulty.
(Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.
A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
Nominal fuel-delivery value = 950 cm³/30 s.

Possible causes for too high a primary pressure:
- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.
For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.

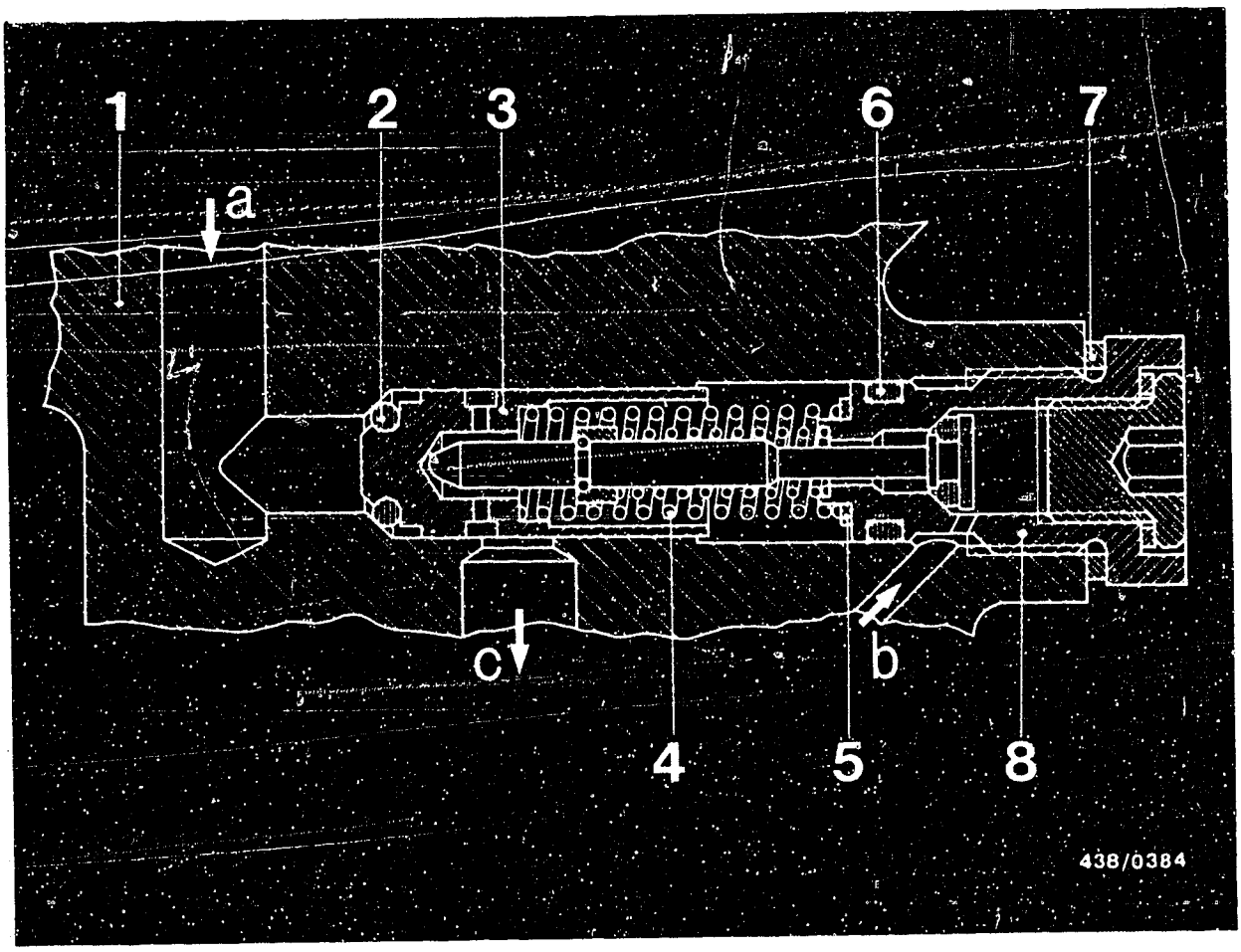


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Primary-pressure adjustment values:

Fuel distributor Part No.	Adjustment values - Primary pressure
0 438 100 045 0 438 100 057	5,4...5,6 bar(5,5...5,7 kp/cm²)

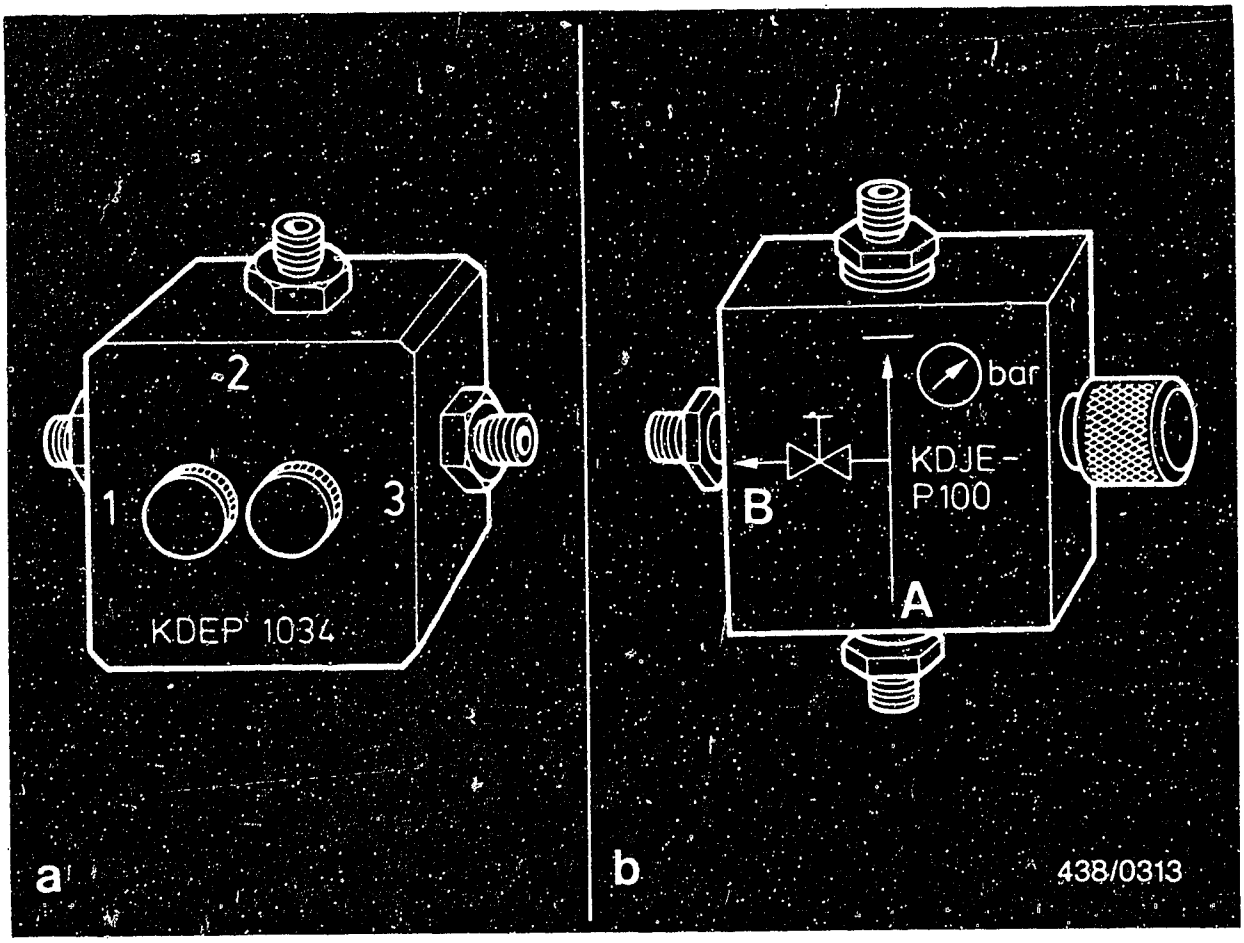


The primary pressure is readjusted by replacing the shims (Item 5).

Nota: 0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

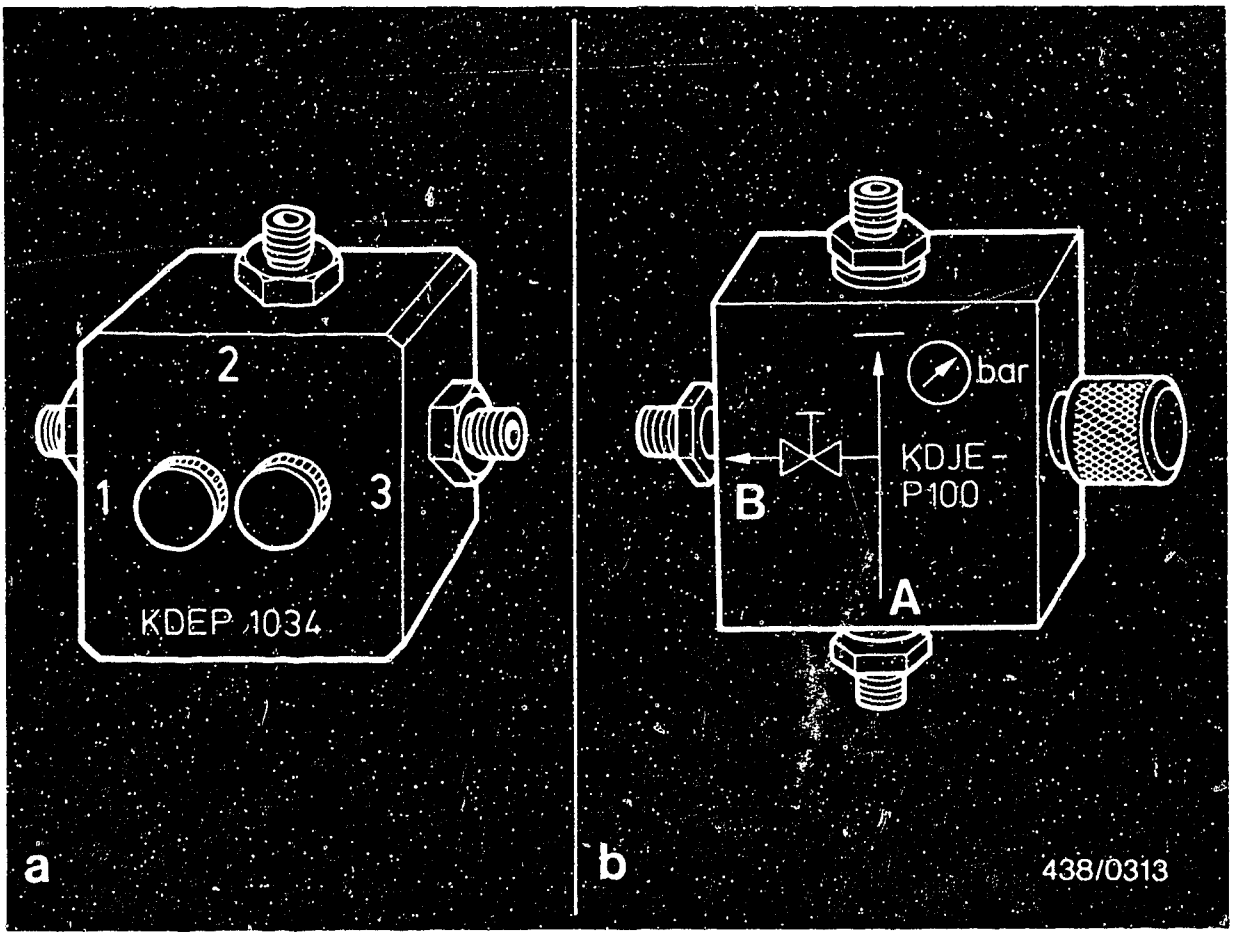
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. TESTING THE ENTIRE FUEL SYSTEM FOR LEAKS

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

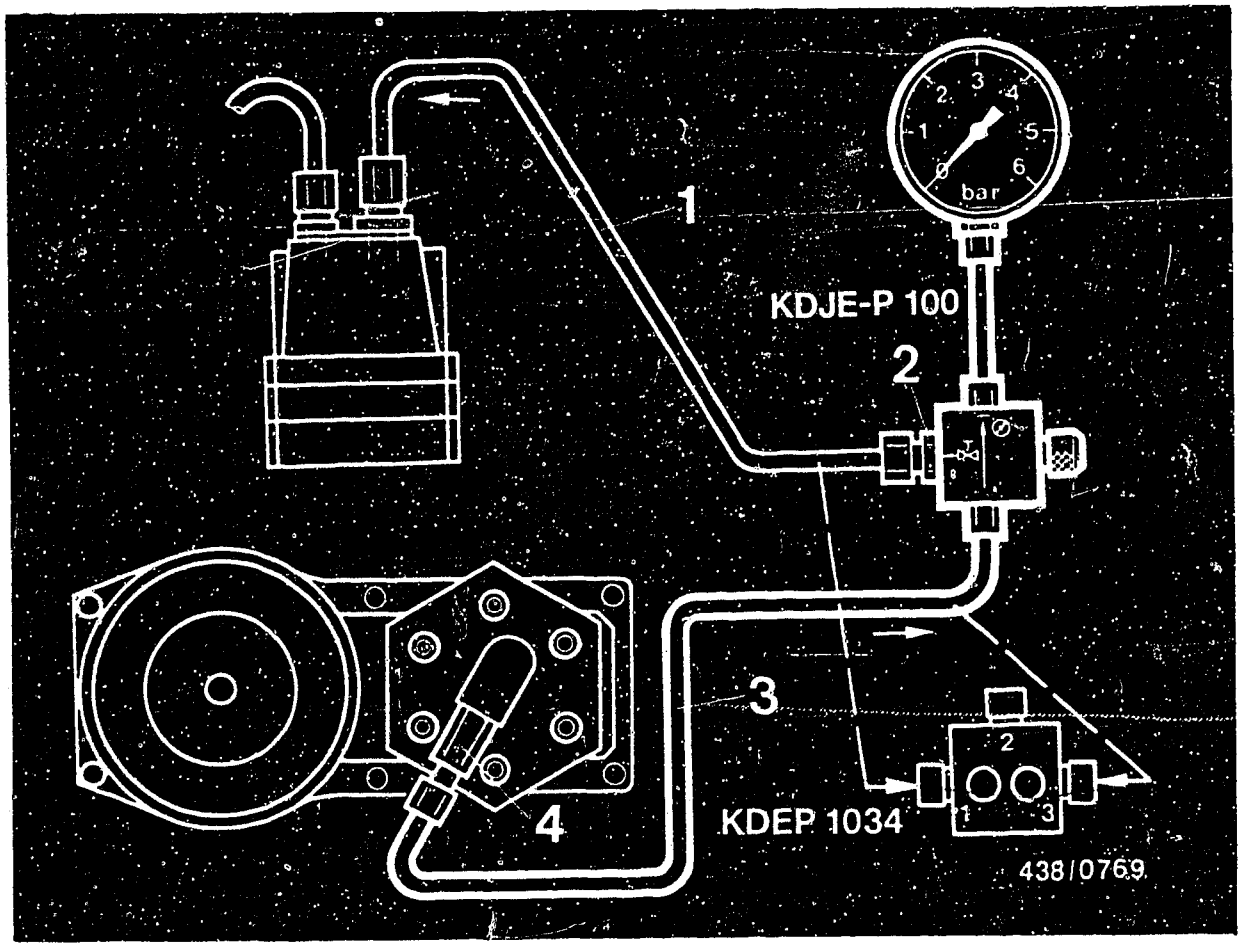


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

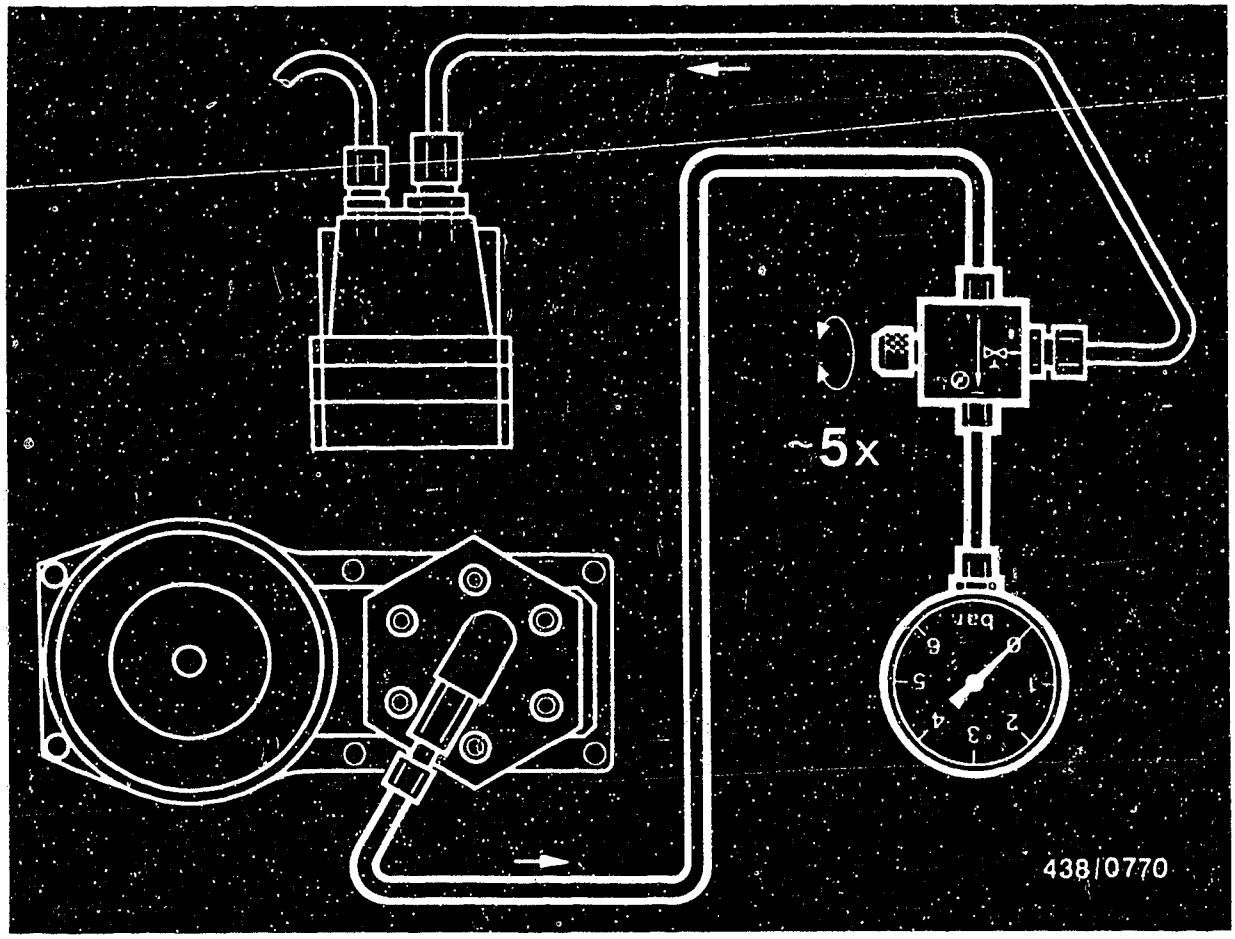
When the direcitonal-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure port (4) of the fuel distributor.

Suspend the pressure gauge from the engine-compartment lid (possibly using a wire hook).



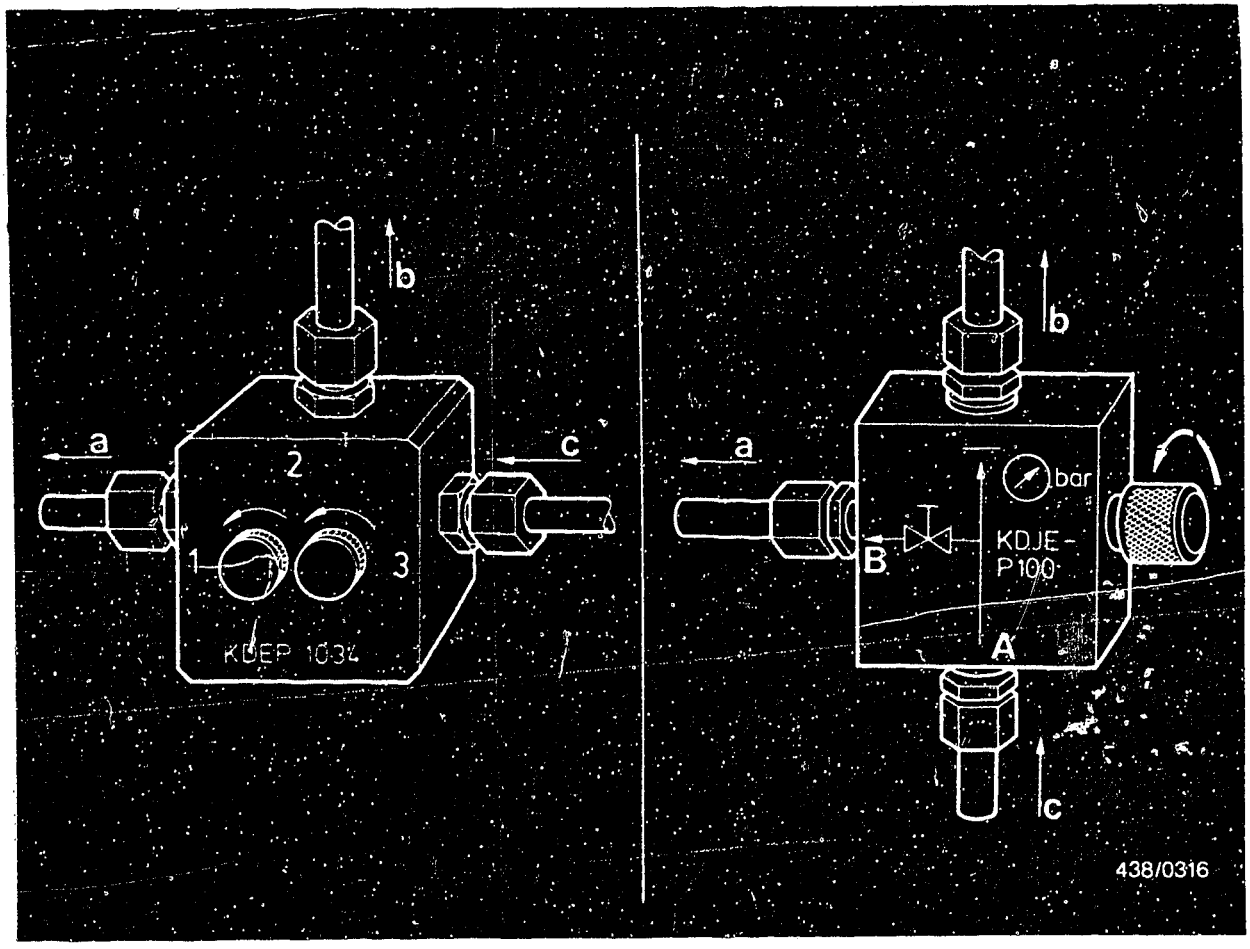
16.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator and from the auxiliary-air device. Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test:

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1/34).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has shut off ("warm" control pressure).

Switch off the electric fuel pump again and observe the pressure drop on the pressure gauge.

Test specifications for leaks

Minimum pressure with fuel accumulator
0 438 170 014 (model 1978):

after 10 minutes:	1.6 bar	(1.7 kgf/cm²)
after 20 minutes:	1.4 bar	(1.5 kgf/cm²)

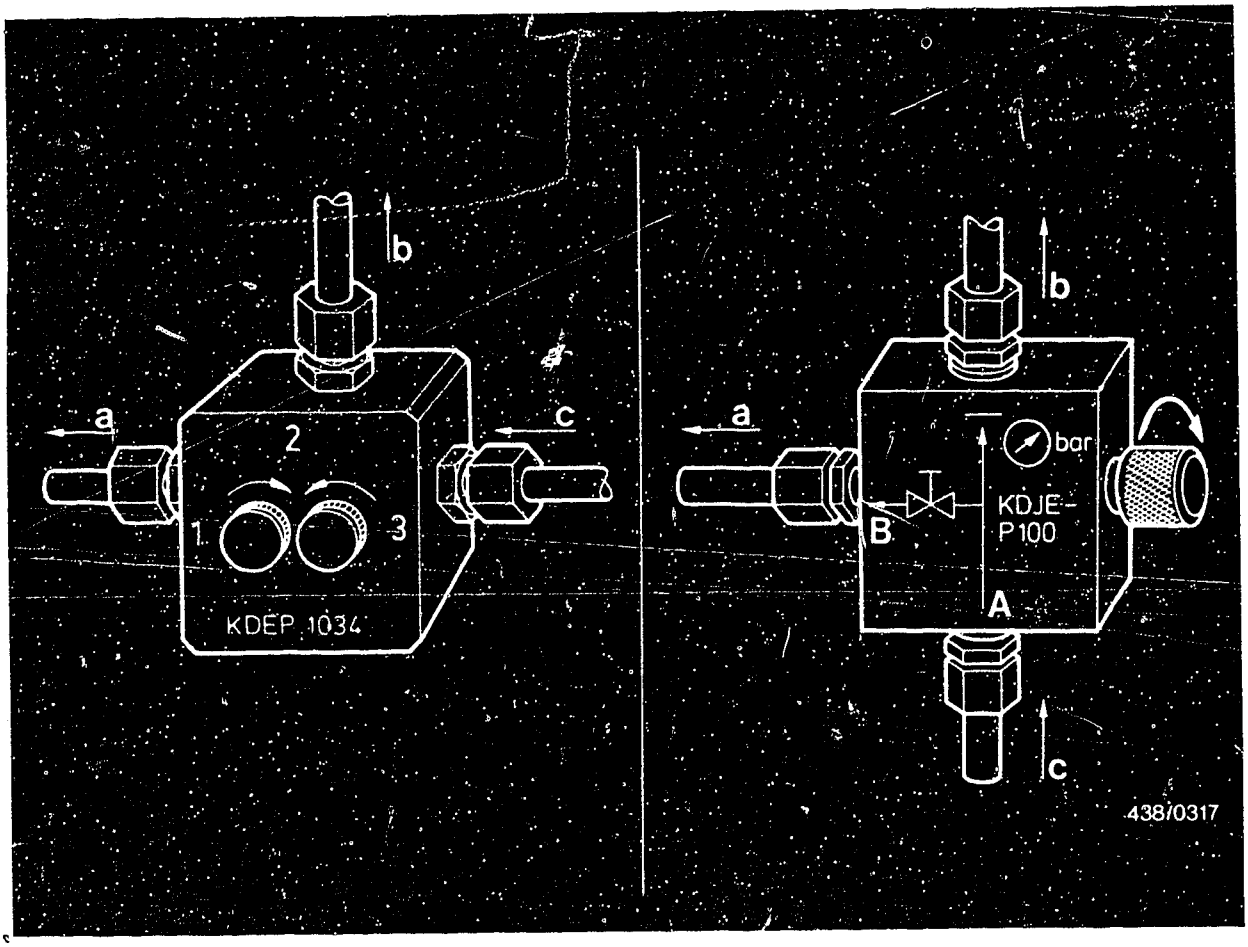
Minimum pressure with fuel accumulator
0 438 170 010 (model 1979/1980):

after 10 minutes:	2.0 bar	(2.1 kgf/cm²)
after 20 minutes:	1.7 bar	(1.8 kgf/cm²)

Minimum pressure with fuel accumulator
0 438 170 030 (as of model 1981):

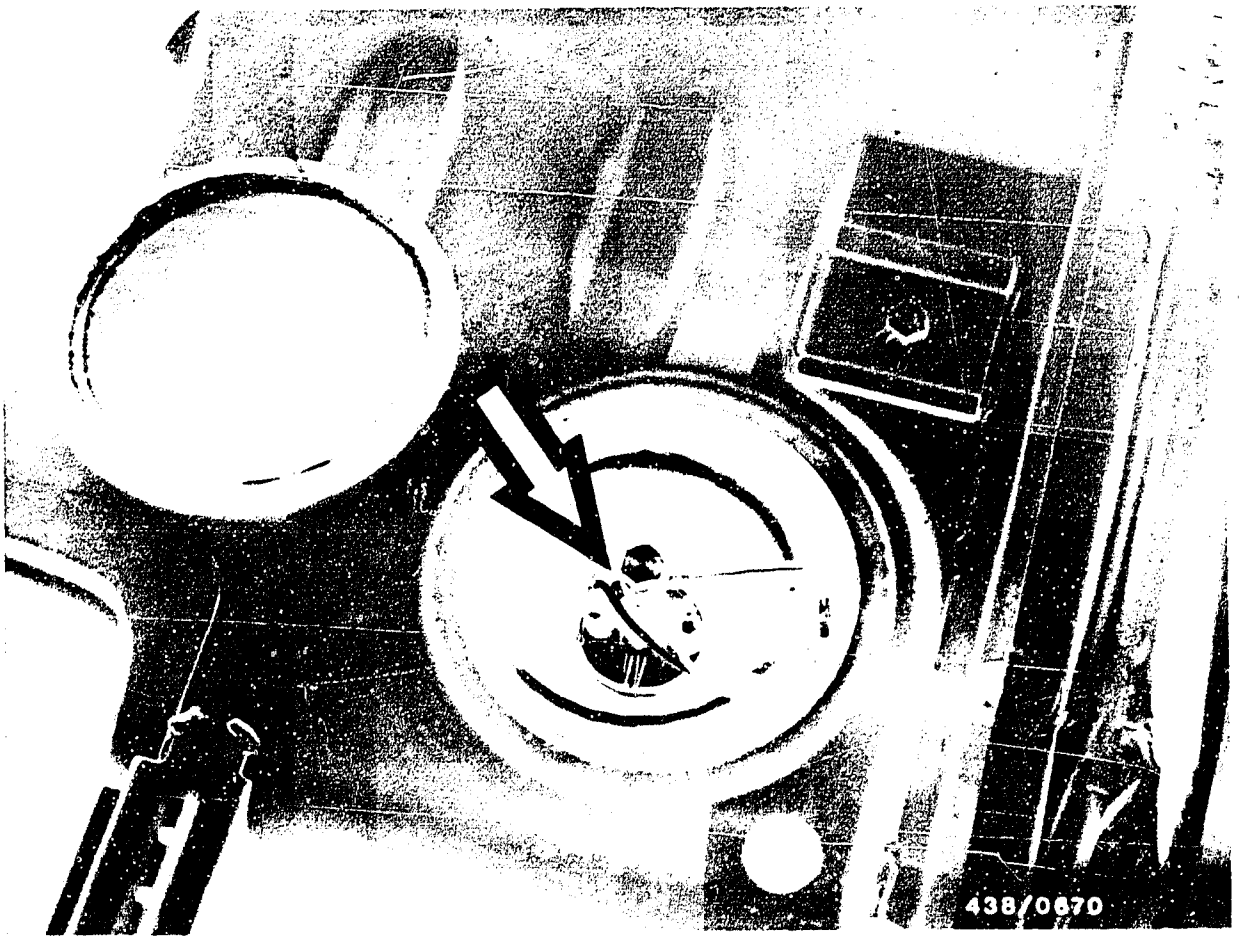
after 10 minutes:	2.5 bar	(2.6 kgf/cm²)
after 20 minutes:	2.4 bar	(2.5 kgf/cm²)

Pressures in the test-specification table are given in bar and in kgf/cm² (gauge pressure).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

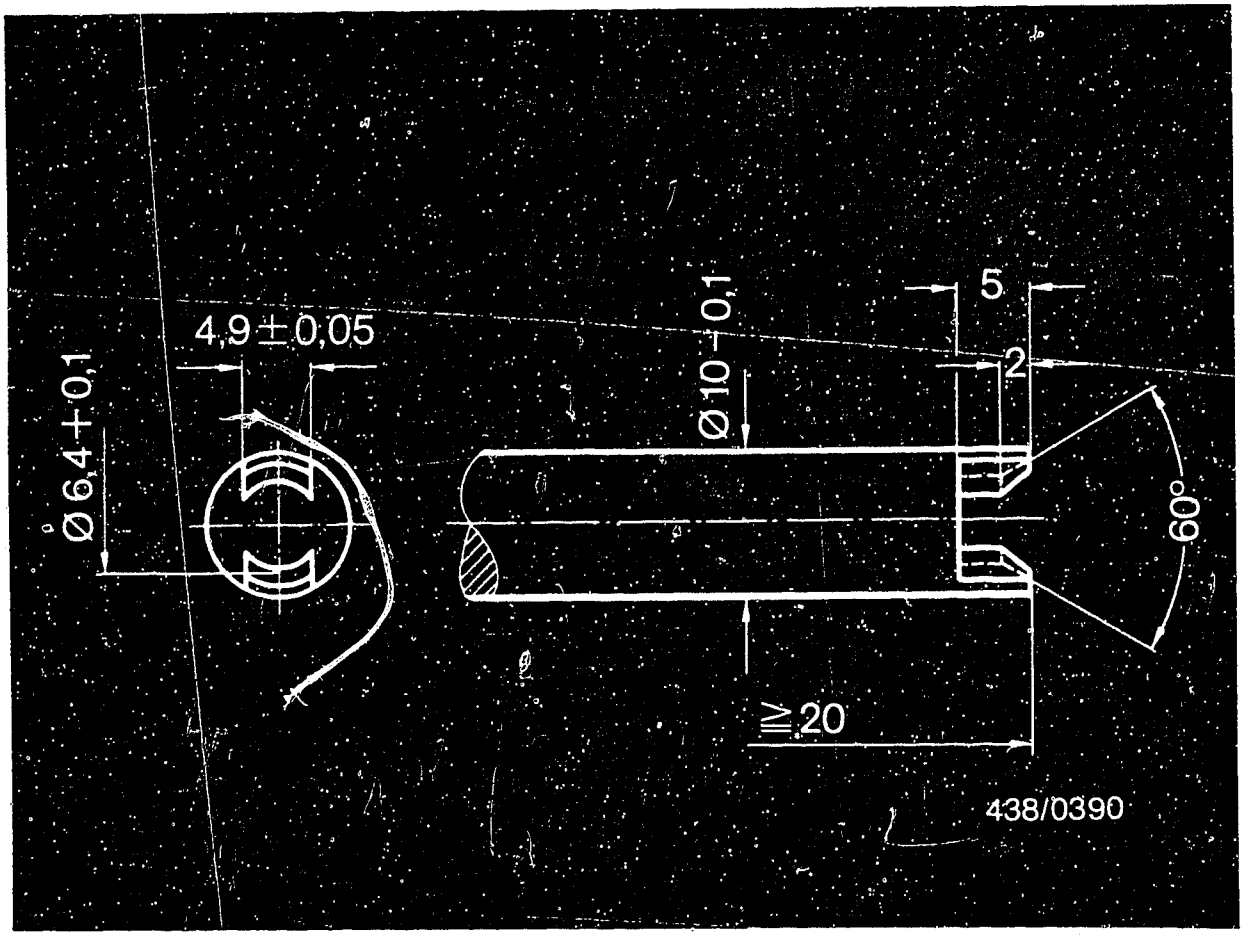
If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.
Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 2.
If the same result is found, the leak is in the primary-pressure circuit. If the test results are correct during the second test, the leak is in the control-pressure circuit.



16.4 Possible causes of a defect in the primary-pressure circuit:

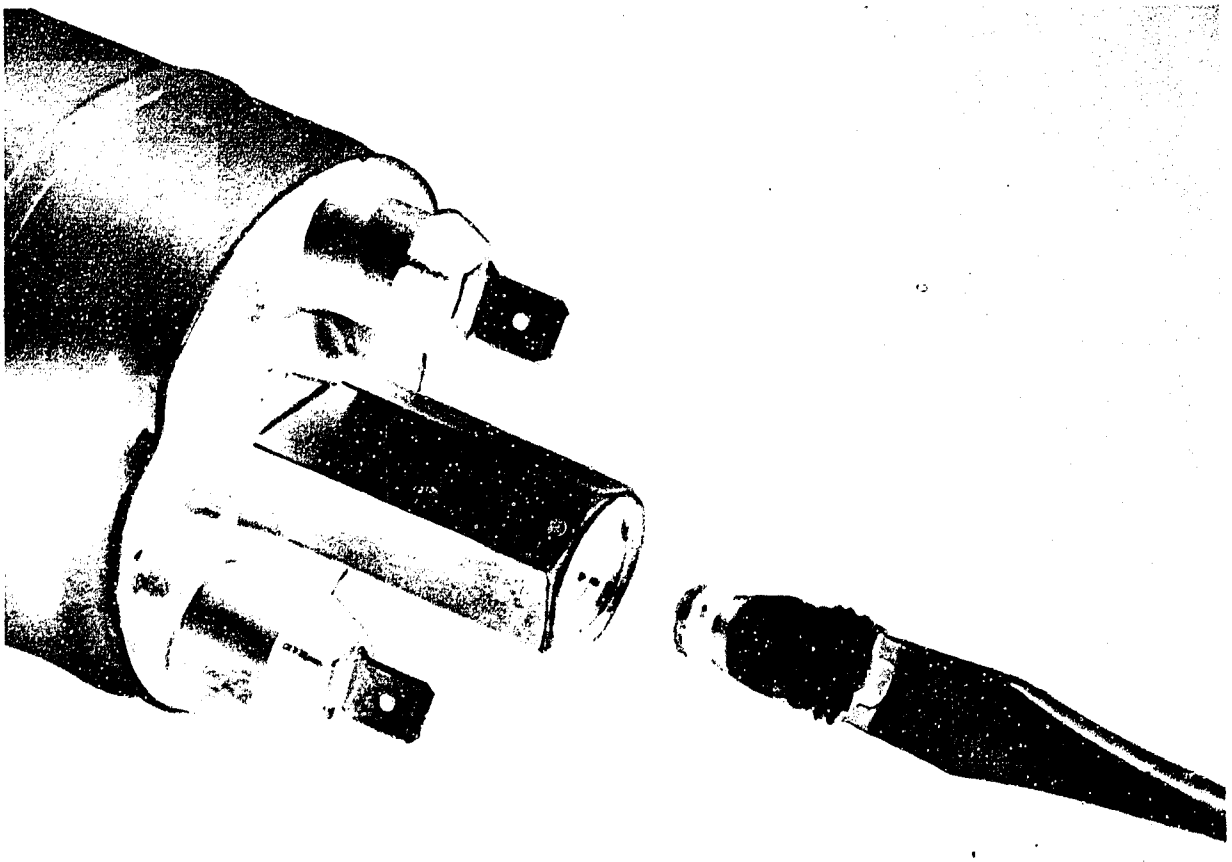
- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

The non-return valve is screwed into the pressure connection piece and can be replaced without removing the electric fuel pump.
Part number of the complete non-return valve:
1 587 410 901.
Remove the luggage-compartment floor board and remove the round cover plate underneath. Unscrew the fuel line from the electric fuel pump.



A special screwdriver is required for removing and installing the non-return valve. Such a screwdriver can be made in accordance with the above sketch.

Unscrew the non-return valve from the pressure connection piece.



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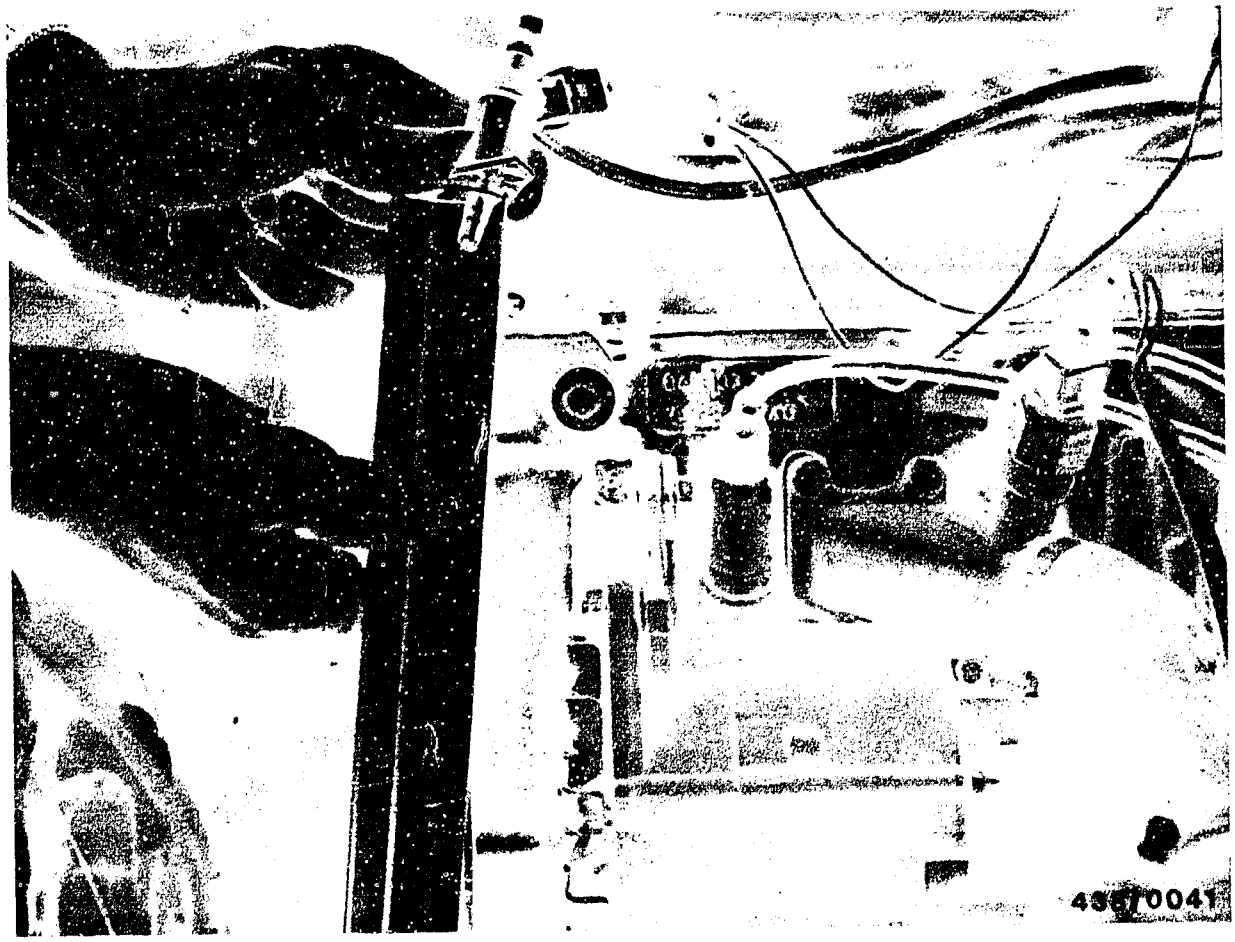
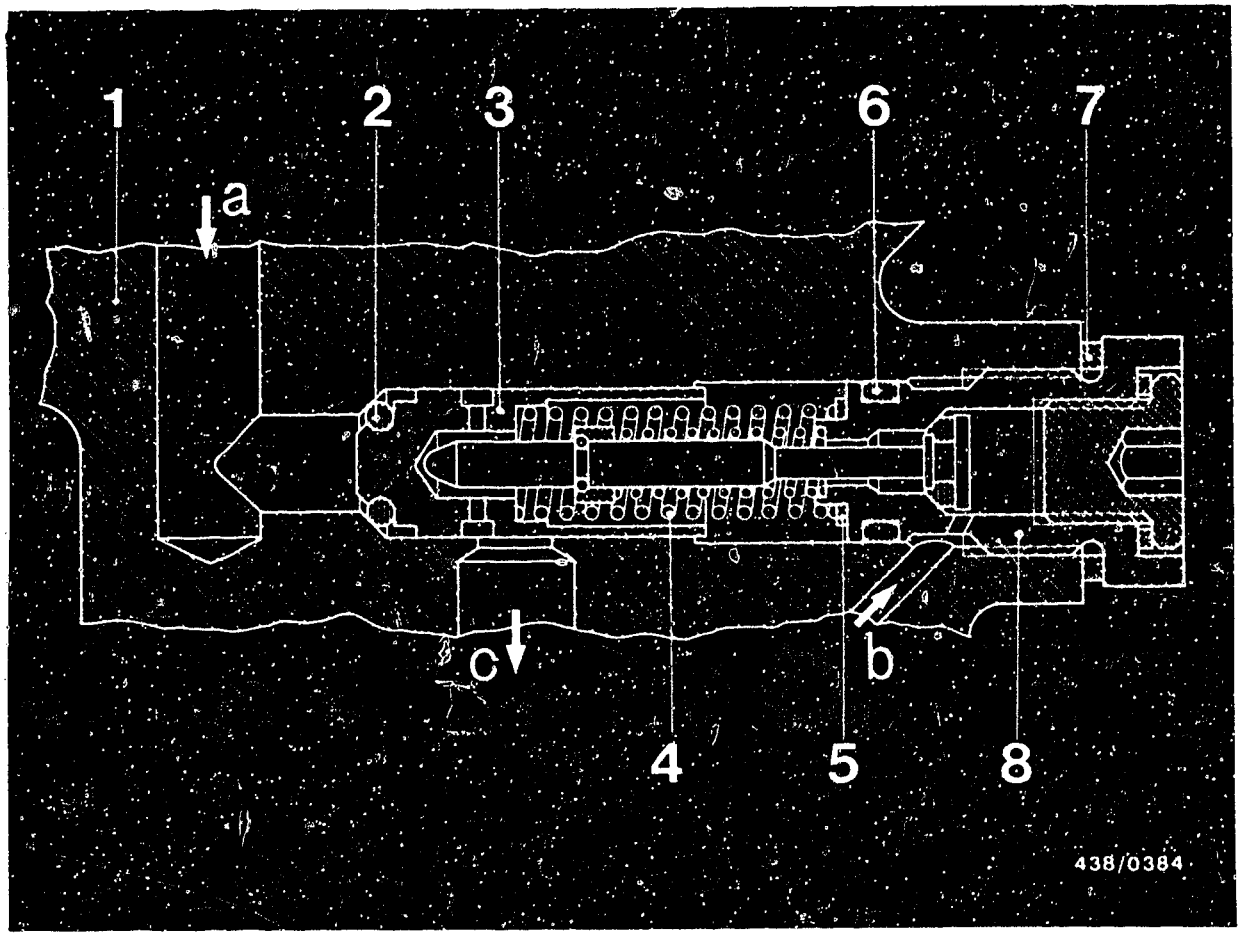
Screw the new non-return valve into the pressure connection piece of the electric fuel pump. Do not overtighten. Do not exceed a tightening torque of 0.4...0.6 Nm (4...6 kgfcm).



- The cold-start valve has a leak.

Remove cold-start valve. Hose line remains connected.

Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve, if leaky.
Finally, adjust the idle speed with the engine at normal operating temperature. See Coordinates G 1.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

- The seal ring on the control piston of the primary-pressure regulator has a leak.

Replace seal ring:

Clean the fuel distributor in the area of the primary-pressure regulator.

Unscrew the large screw plug (8) with the complete push-up valve. Also remove the shims (5), control spring (4) and control plunger (3).

Replace the seal ring (O-ring) (2) on the control plunger. Install the control plunger and the control spring.

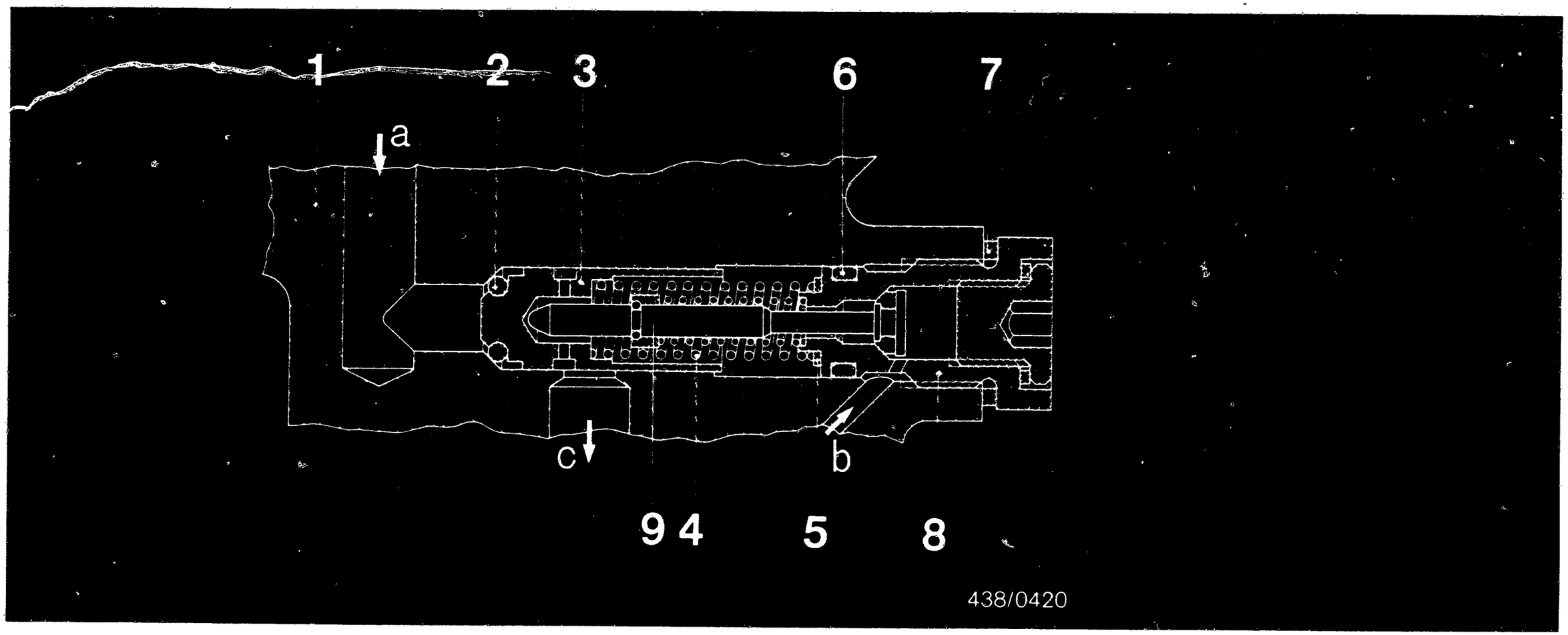
Screw in the screw plug with the complete push-up valve and with shims (as found when removing) and new seal rings (6 and 7).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure:

Fuel distributor 0 438 100 045
0 438 100 057

Checking value: 5.2...5.8 bar (5.3...5.9 kgf/cm^2)
(gauge pressure)
Setting value: 5.4...5.6 bar (5.5...5.7 kgf/cm^2)



a = Primary pressure
b = from warm-up regulator
c = Fuel return

1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shims
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

16.5 Possible causes of a defect in the control-pressure circuit:

• The push valve (9) in the primary-pressure regulator has a leak.
Since the seal ring of the push valve is rigidly vulcanized onto the valve needle, the whole push valve (ready-assembled unit) must be changed.
Clean the fuel distributor in the region of the primary-pressure regulator. Unscrew the large screw plug (8) with the complete push valve. Pay attention to control spring (4) and shims (5). Screw in new push valve with the previously used number of shims (5), a new O-ring (6) and a flat seal ring (7).
Then check the primary pressure once again, correcting if necessary.

Primary pressure

Test specifications and settings:

Fuel distributor 0 438 100 045
0 438 100 057

Checking value: 5.2...5.8 bar (5.3...5.9 kgf/cm^2)

Setting value: 5.4...5.6 bar (5.5...5.7 kgf/cm^2)

Pressures are given in bar (gauge pressure) or in kgf/cm^2 (gauge pressure).

17. TESTING THE INJECTION VALVES

Remove the injection valves for testing. To do this, unscrew the two brackets (each holding 2 injection valves). When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.

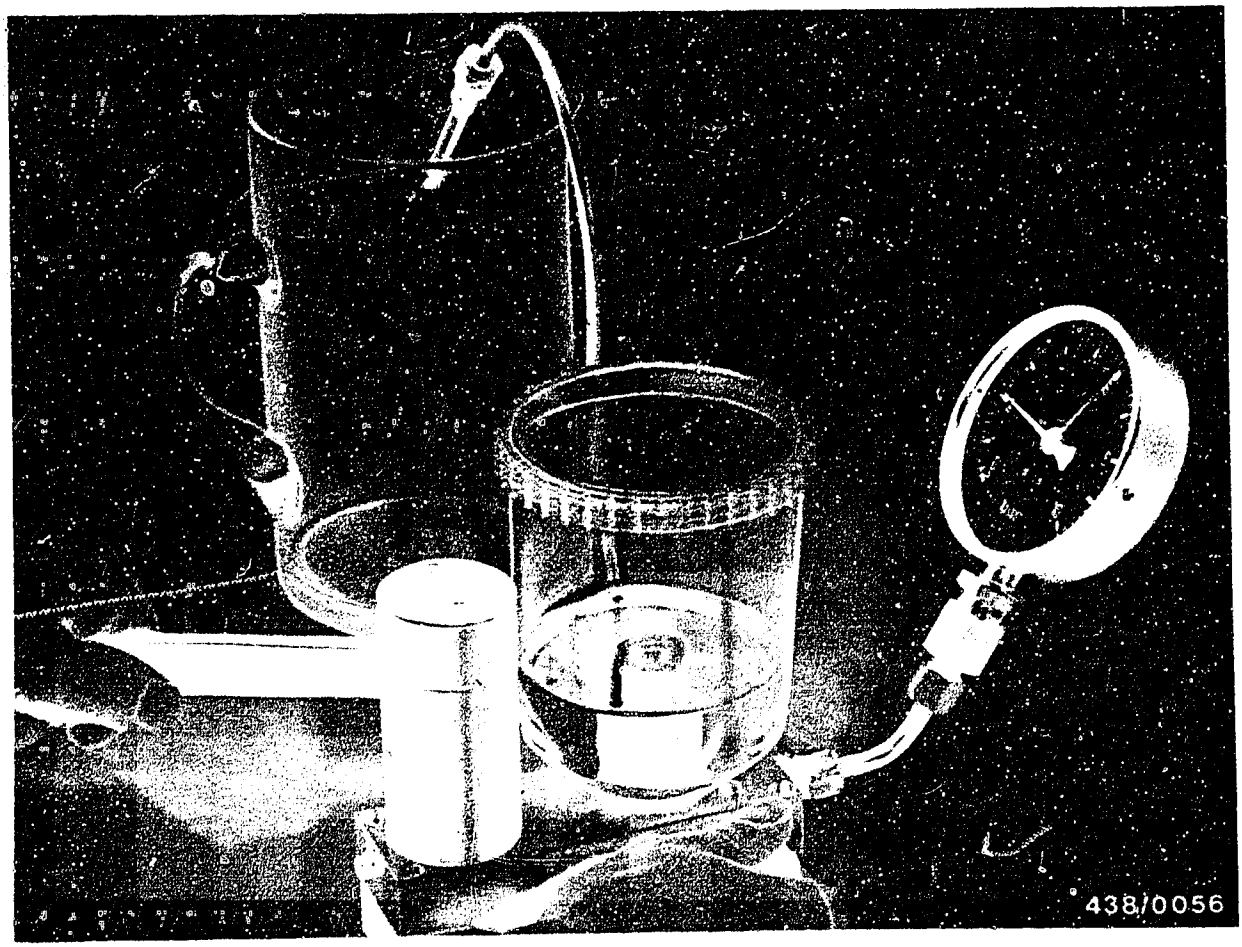
Before refitting the injection valves check the seals on the valve stem to see whether they are deformed or damaged. If need be, use new seals (Saab service parts) in order to prevent leaks and thus the entry of unmetered air.

17.1 Test equipment and test media:

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

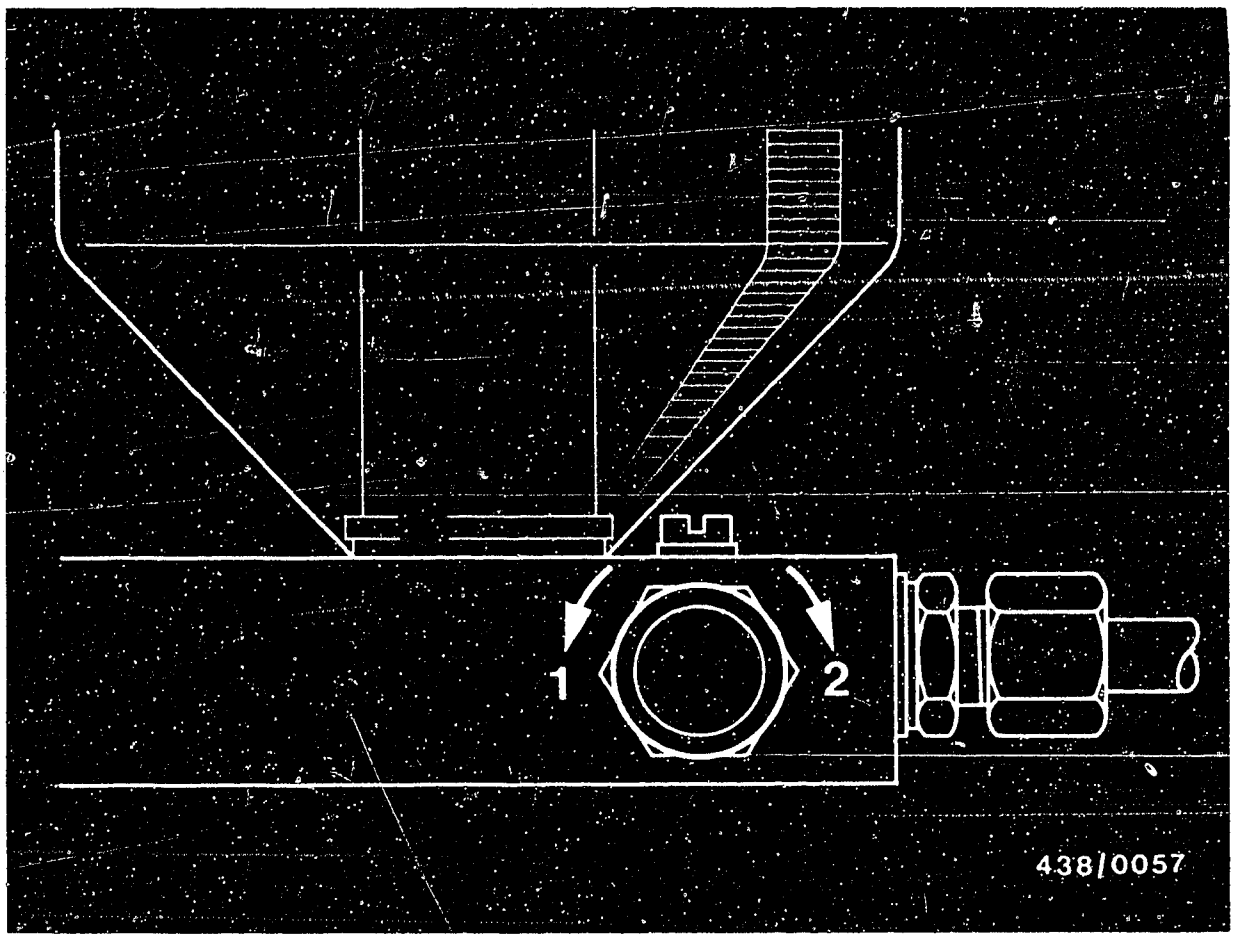


17.2 Connecting the injection valve to the tester

Connect injection valve to valve tester and bleed the discharge tubing by moving the lever back and forth several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

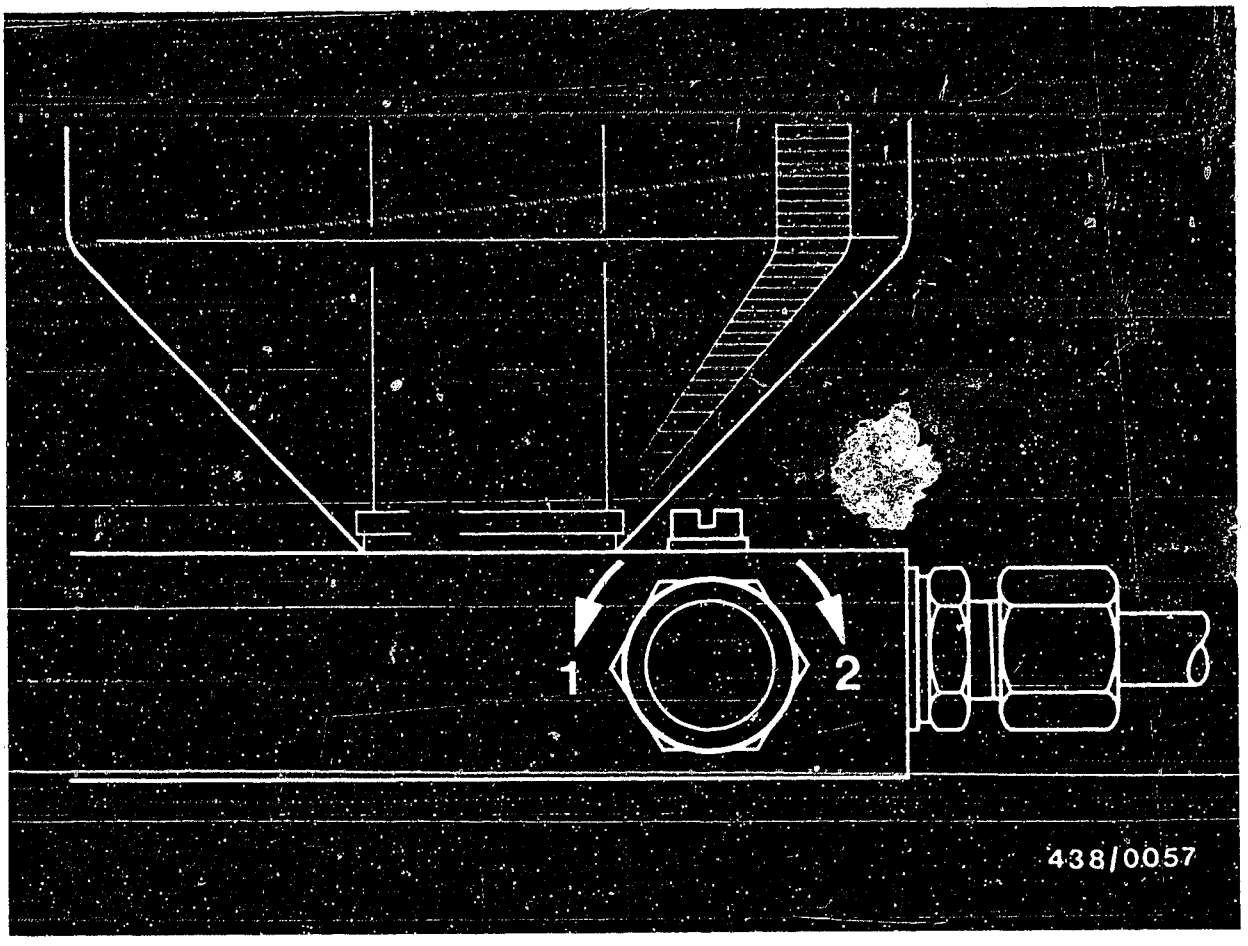
17.4 Testing the opening pressure

Test specifications - opening pressure:
Part No. 0 437 502 004 up to FD 828 (1978 model)
Opening pressure: 2.5...3.6 bar (2.6...3.7 kgf/cm²)

Part No. 0 437 502 004 from FD 829 (1979 model)
Opening pressure: 2.7...3.8 bar (2.8...3.9 kgf/cm²)

Part No. 0 437 502 012 (from 1980 model)
Opening pressure: 3.0...4.1 bar (3.1...4.2 kgf/cm²)

Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure)



With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke). If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.3 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.

438/0058

17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

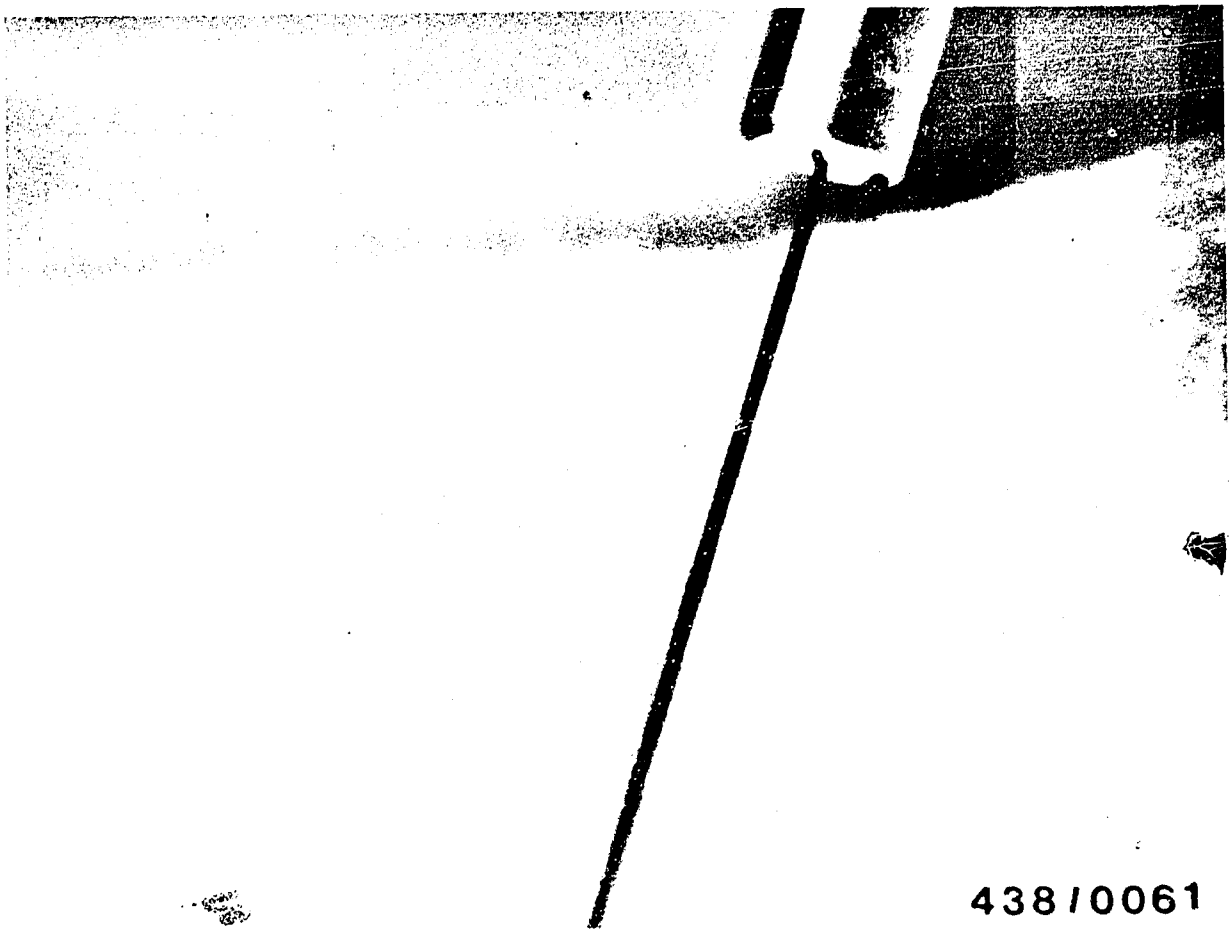
438/0059

Illustration shows single-sided but nevertheless good spray formation.

438/0060

Poor spray formation; replace injection valves.

Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves

Illustration shows "cord spray".

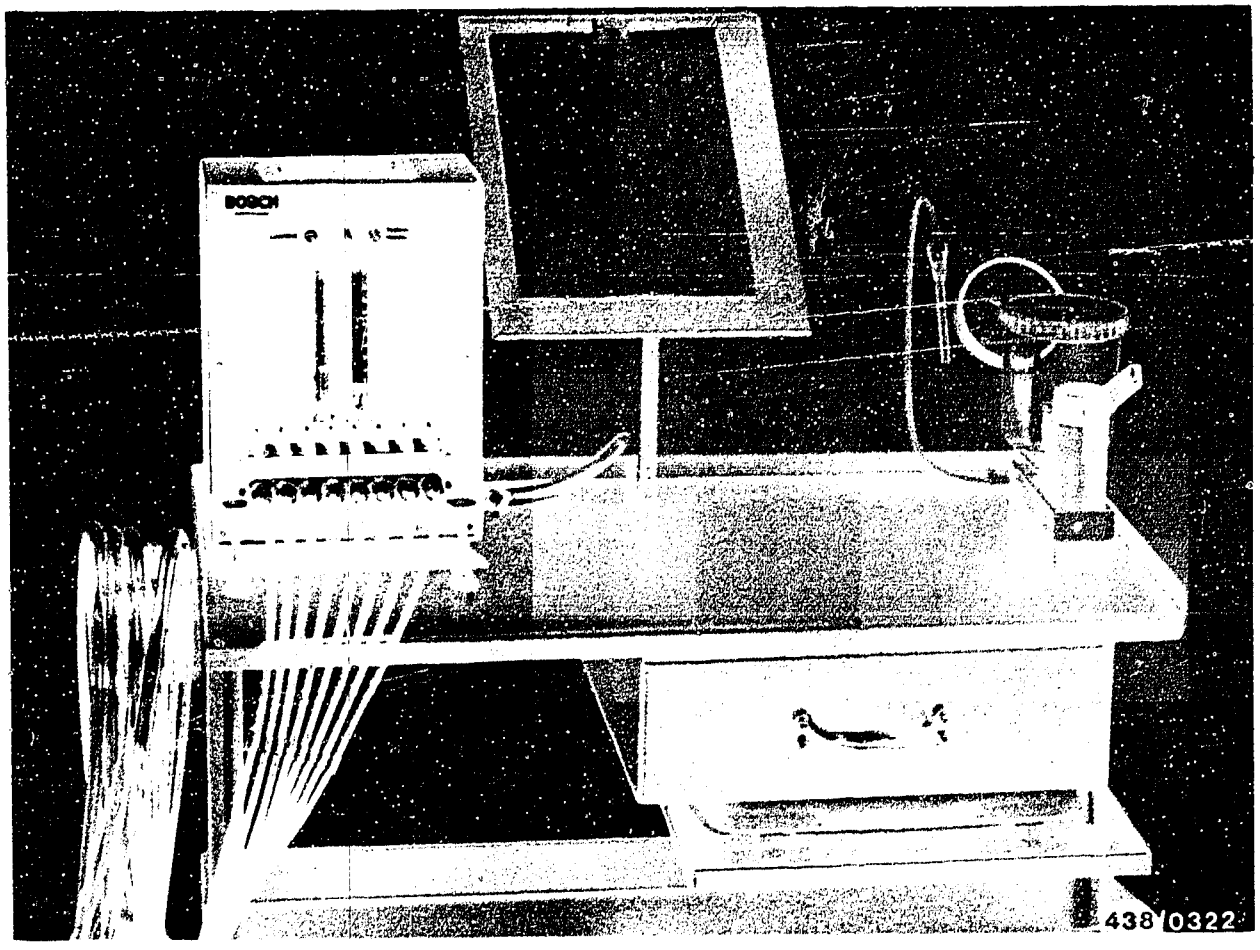
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

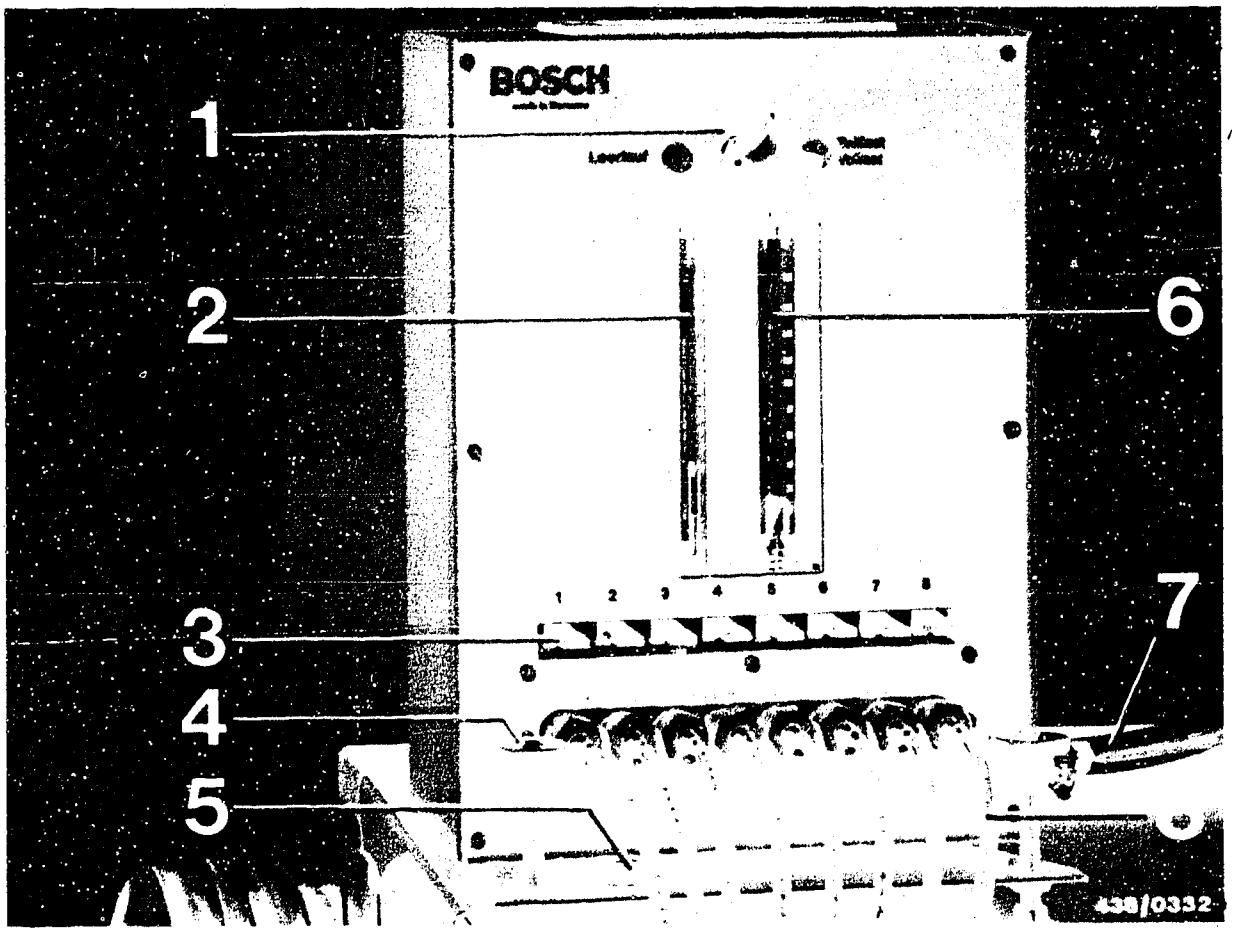
Idle-speed adjustment is described on Coordinates G 1.



18. Comparative measurement of fuel delivery of fuel distributor outlets.
This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

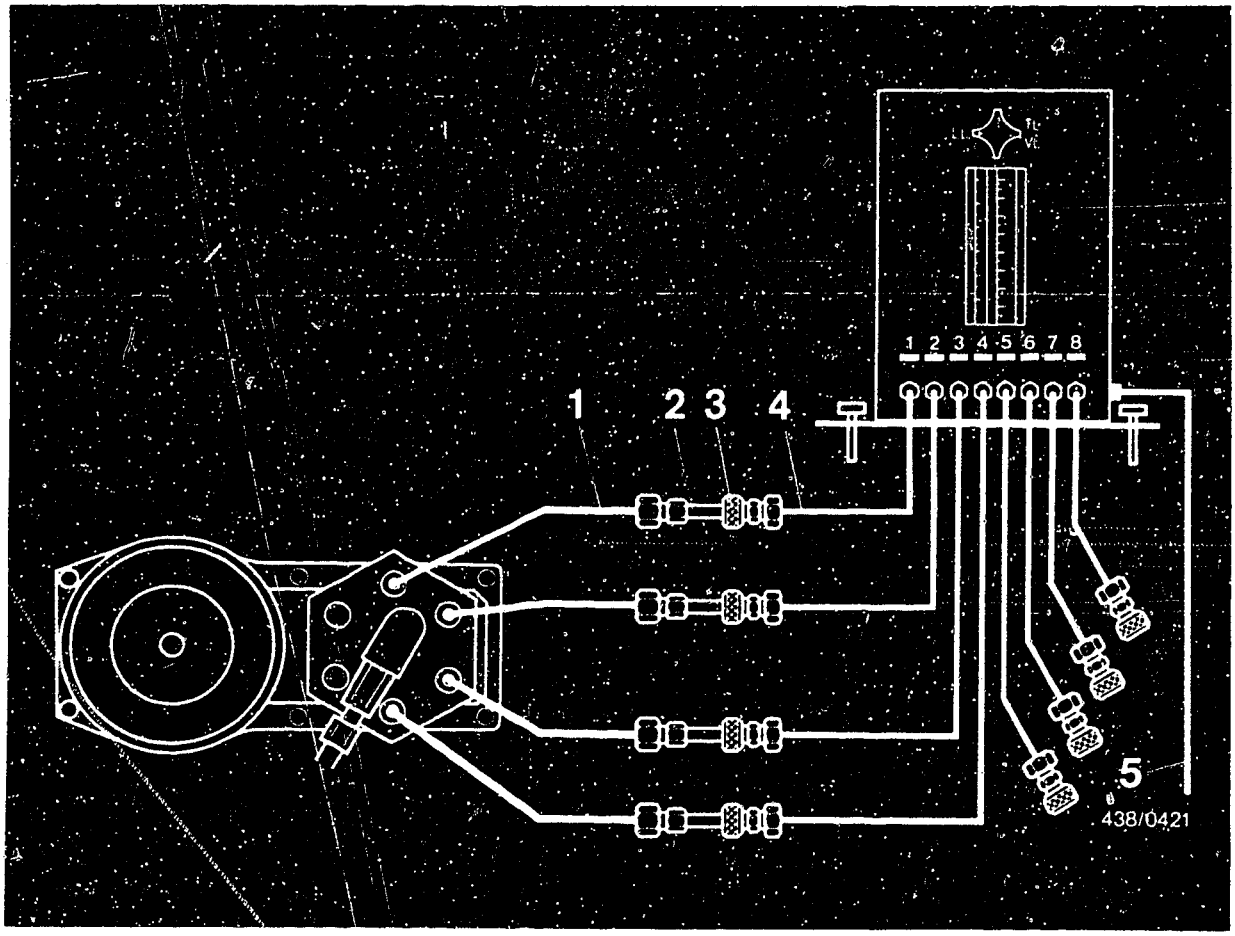
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Fuel distributor injection tubing
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

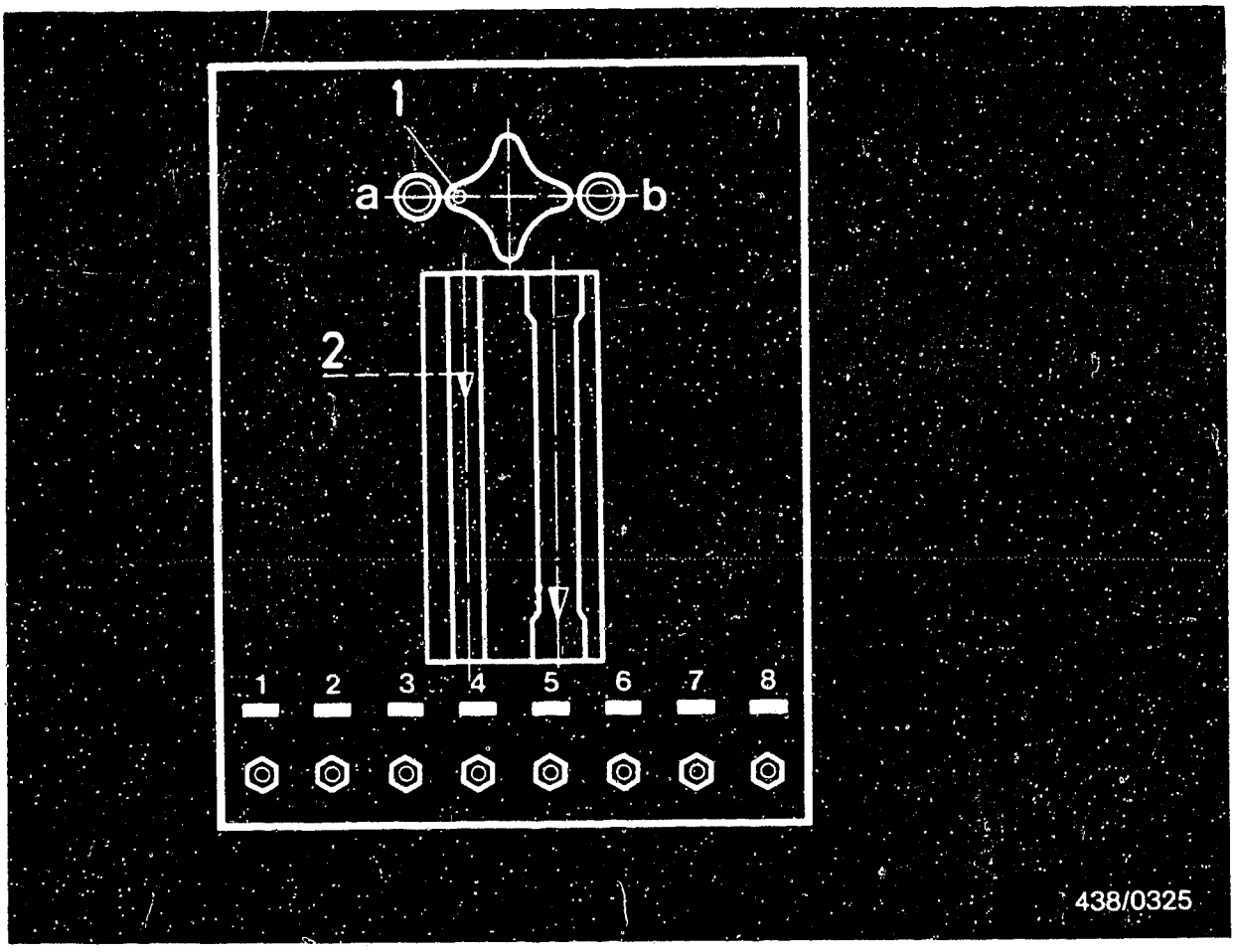
Remove injection valves; the injection tubing remains connected. To do this, unscrew the two brackets (each holding 2 injection valves) and pull the injection valves out of their bores.

Before refitting the injection valves check the seals on the valve stem to see whether they are deformed or damaged. If need be, use new seals (Saab service parts) in order to prevent leaks and thus the entry of unmetered air.
Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

Note:
Insert the injections valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.
Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the rubber hood so that air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Raise the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.

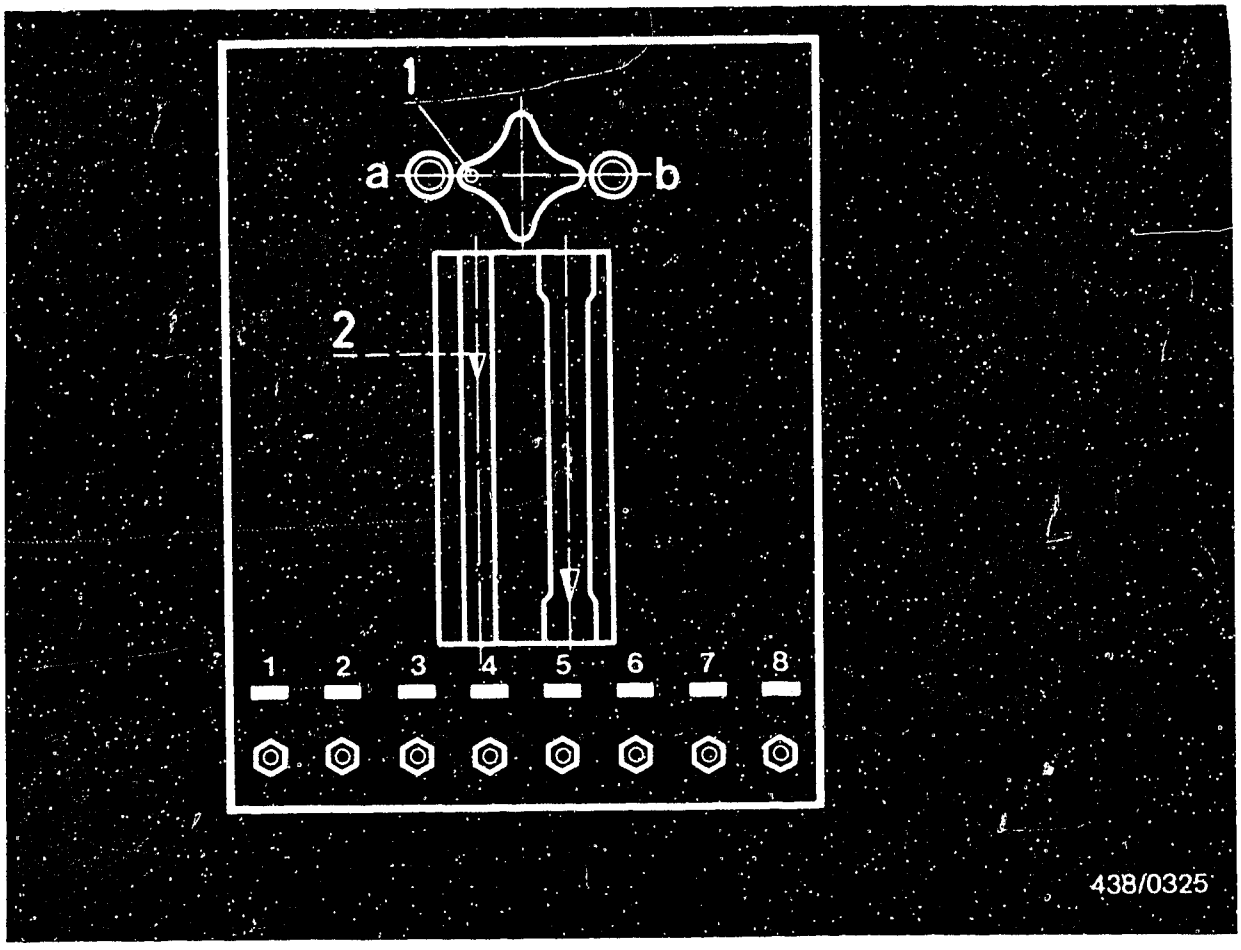


1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

18.5 Testing

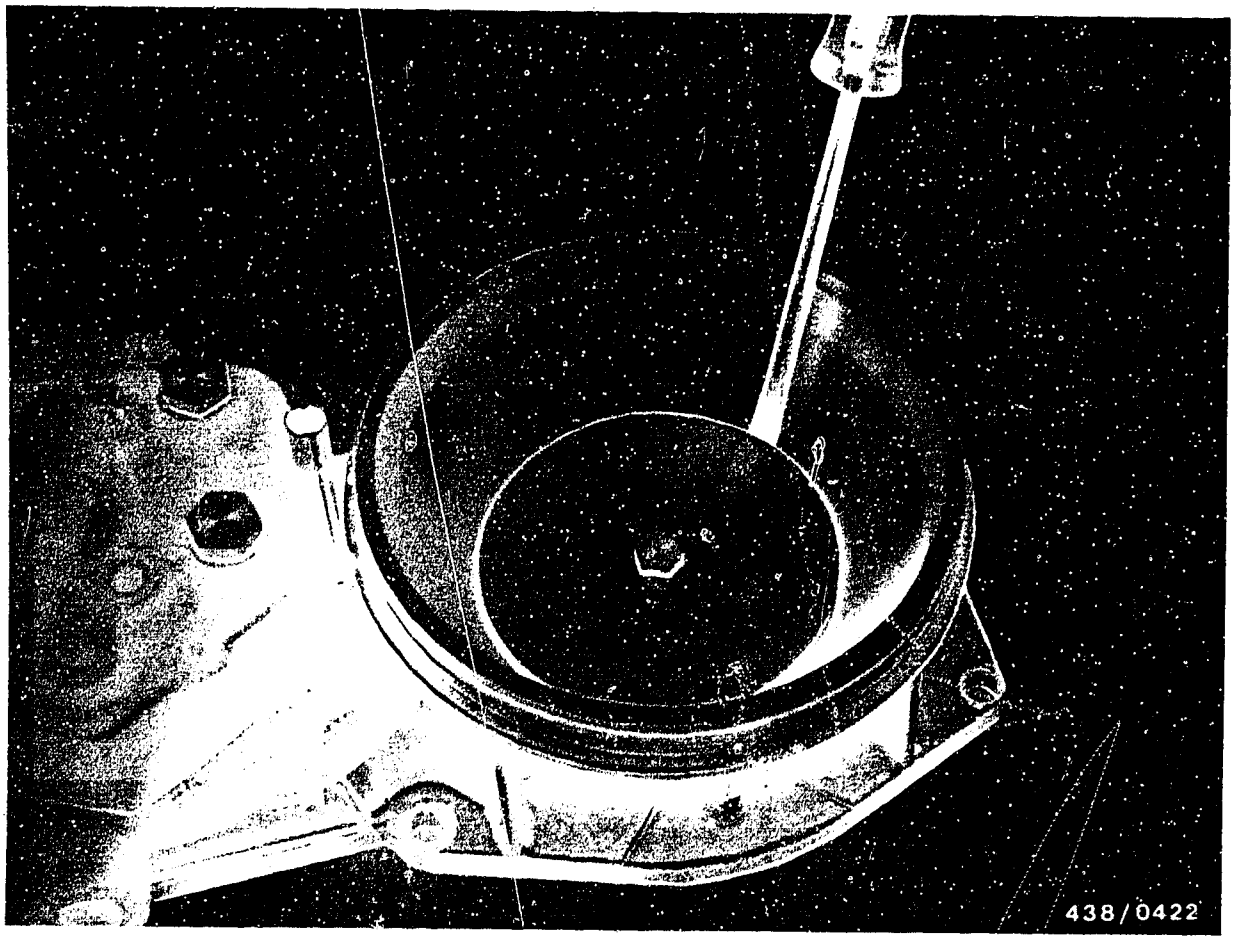
The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

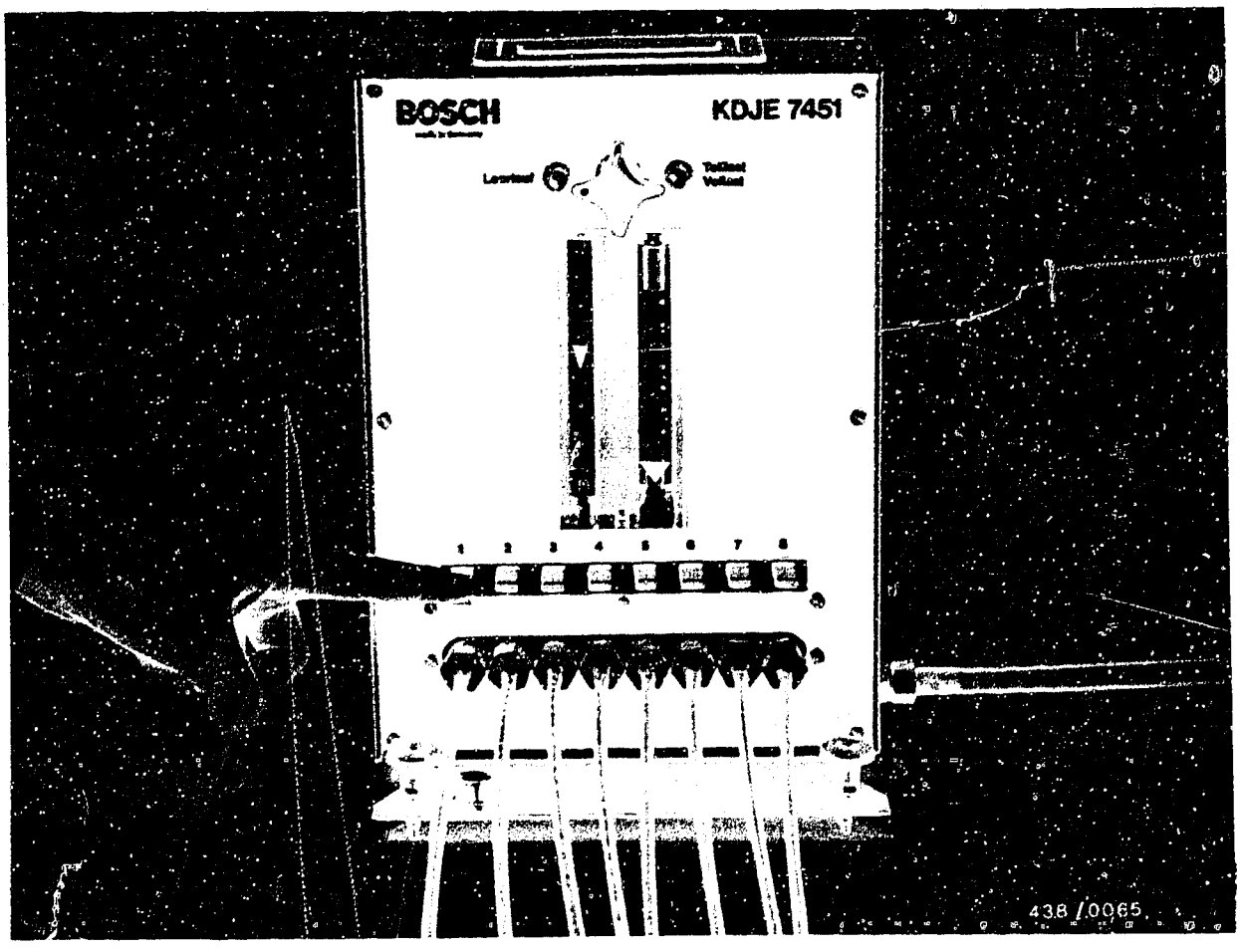
a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle-position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:
Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.
The "set point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

	Setpoint (cm^3/min)	Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.8
Part load	40.0	44.0
Full load	160.0	175.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

18.7 Final operations

Re-fit the injection valves properly. Also fit the air filter. Make sure that all lines are laid correctly. Re-connect the electrical safety circuit of the K-Jetronic properly.
Use a trial run to check that there are no leaks in line connections. Finally check the idle-speed adjustment; if necessary, correct (Coordinates G 1).

19. IDLE-SPEED ADJUSTMENT

19.1 Test conditions:

Warm up the engine for adjusting the idle speed (oil temperature approx. 80°C).

Important note:

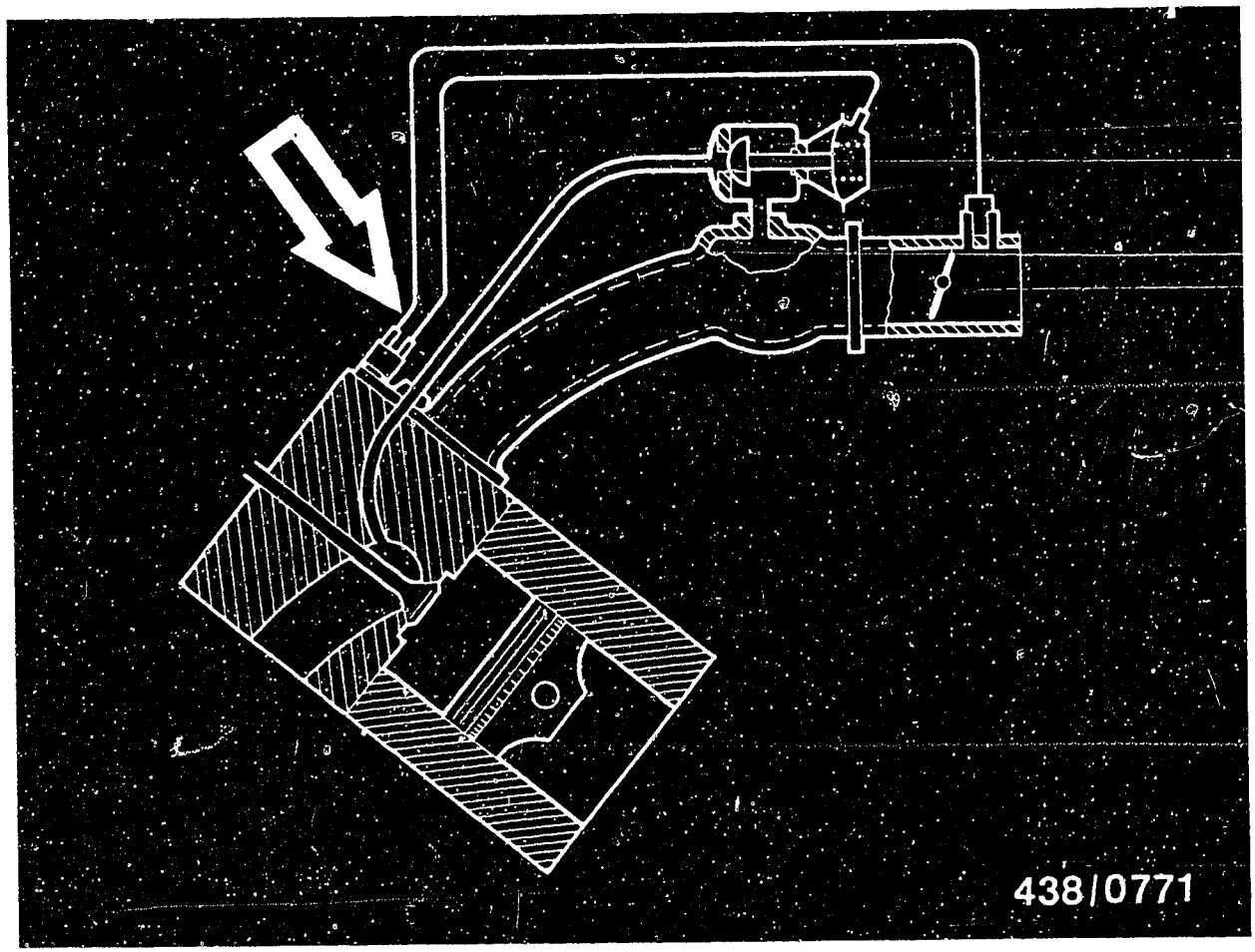
Never rev the engine immediately after starting, but let it idle for a while first so that the oil pressure in the turbo-supercharger is built up thus ensuring the lubrication of the supercharger.

Moreover, the engine must not be switched off immediately when operating in high-speed range, but must be allowed to idle a little first before being switched off. If this point is not observed, the turbo-supercharger runs on for a long time without lubrication and can thus be damaged. Besides this, a short period of idling before switching off the engine leads to better heat dissipation from the turbo-supercharger.

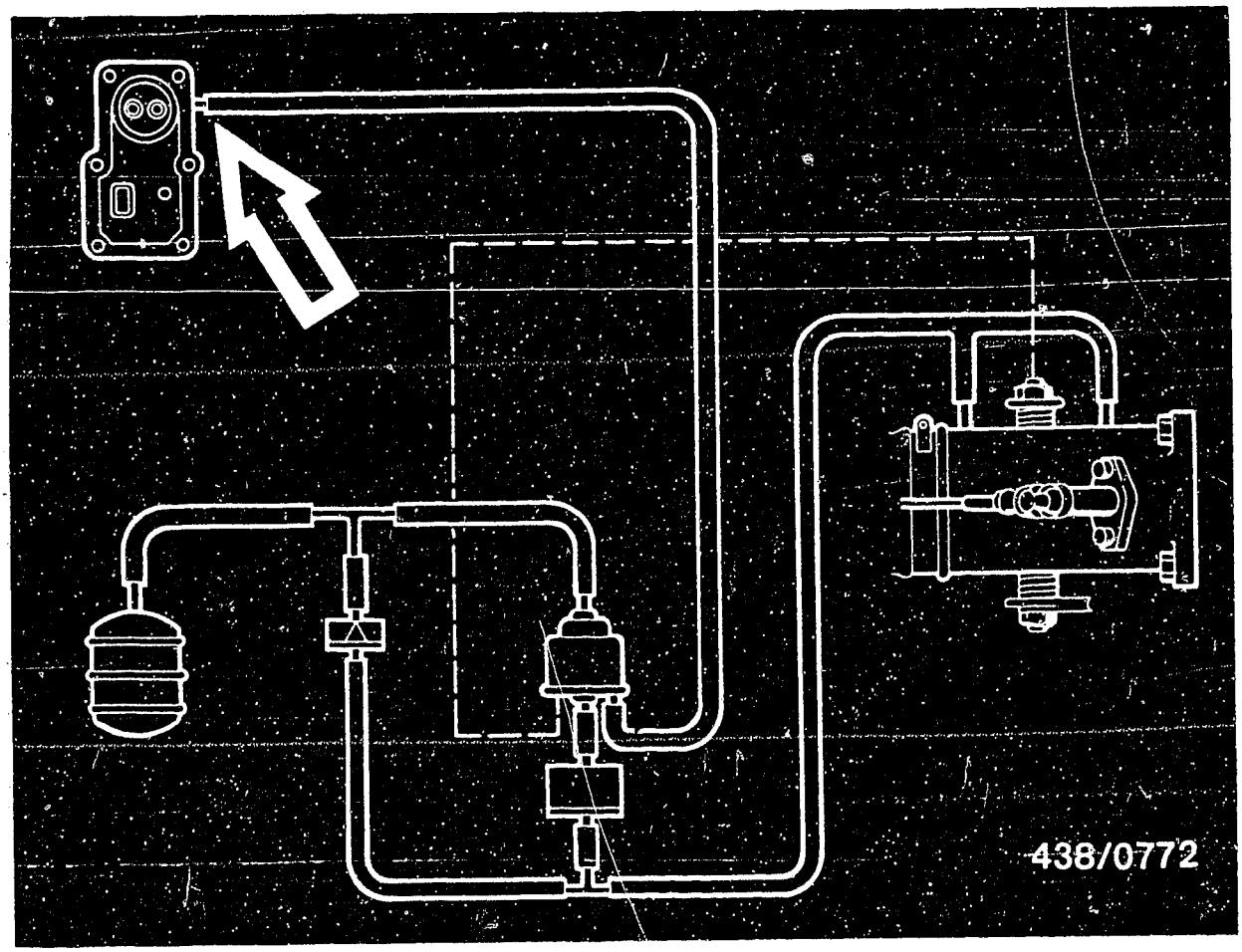
If the fuel-injecting tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.

The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.

In vehicles with an air conditioner, this should be switched off in order to stabilize the engine speed.



On automatic vehicles of the Sweden version the exhaust-gas recirculation system must be rendered inoperative while making the idle adjustment. To do this, remove the control hose from the thermostat valve (arrow) and seal off.



On vehicles as from the 1980 model, remove the hose line from the intake-manifold-pressure connection port of the warm-up regulator (arrow) and seal off.

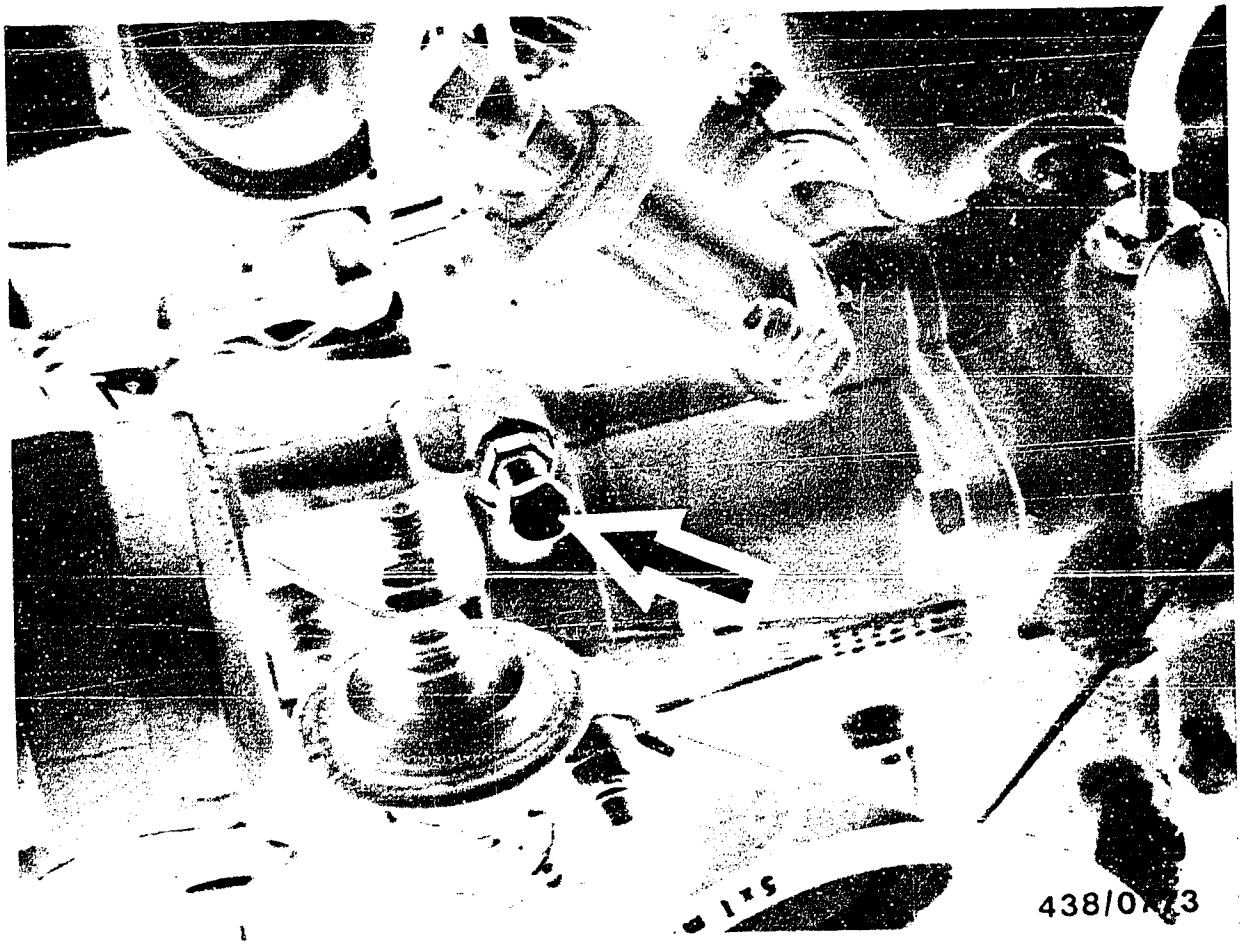
It should be mentioned at this point that, following the actual idle adjustment, it is necessary to test the full-load enrichment function. If there is no full-load enrichment this can lead to engine damage.

This test step is described on Coordinate G9.

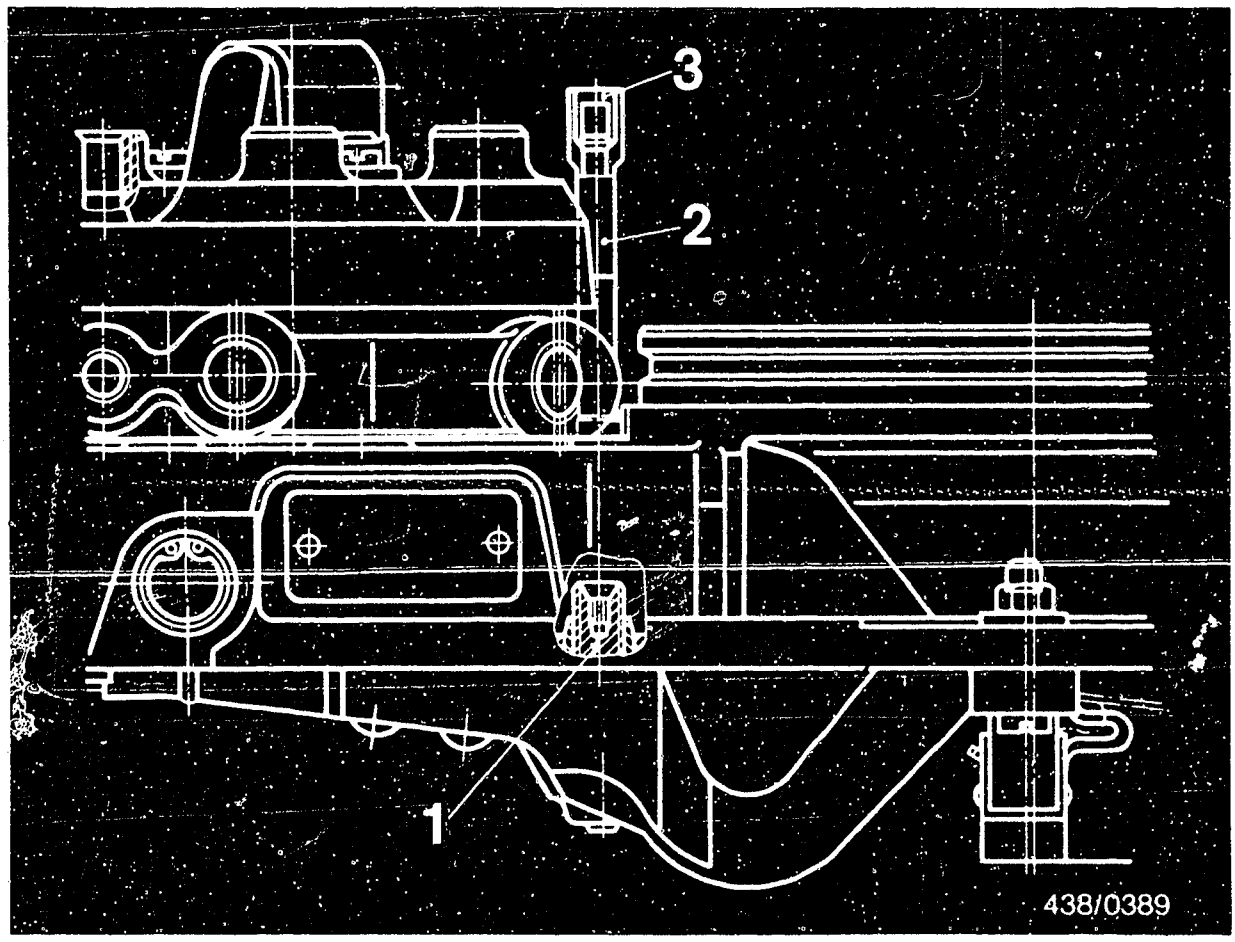
19.2 Idle adjustment

Test specifications:

Idle speed:	
All versions:	825 ... 925 min^{-1}
CO concentration	
Europe version general:	0.5 ... 2.5 % by vol. CO
Sweden version:	1.0 ... 2.0 % by vol. CO



Adjust the idle speed at the bypass screw (arrow) on the throttle-valve assembly. After adjusting, tighten the lock nut securely.



Adjusting the CO concentration

The CO concentration is adjusted by turning the idle-mixture-adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.
After removing the safety cap (3) of the guide tube (2), the adjusting wrench is passed through the guide tube and inserted into the idle-mixture-adjusting screw.
Turning to the right = richer mixture
Turning to the left = leaner mixture

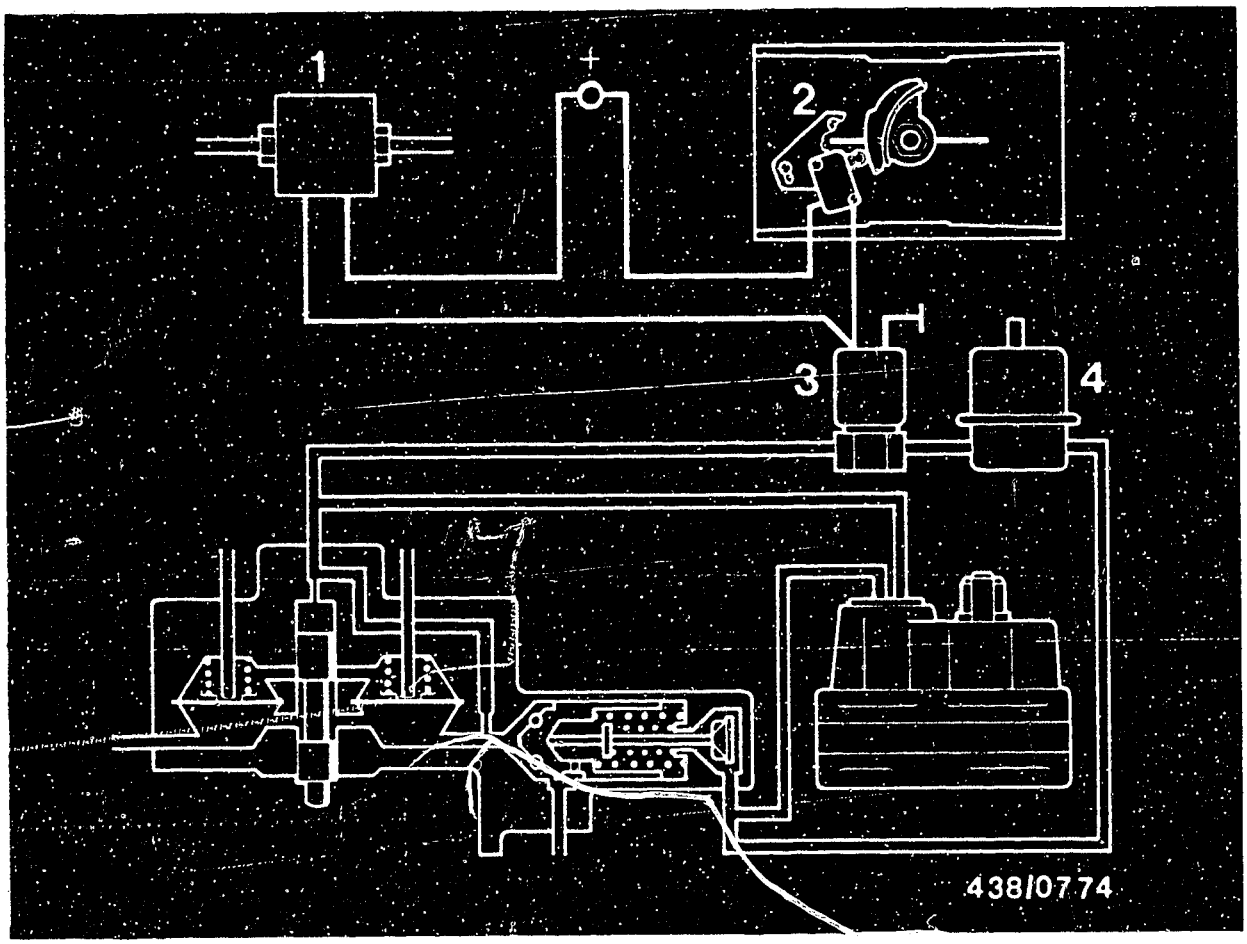
Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

19.3 Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.
Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.
These anti-tamper caps come in different colors. The cap to be used for the after-sales service of updraft air-flow sensors is red.
It can be obtained from Bosch under part number 3 430 522 002.

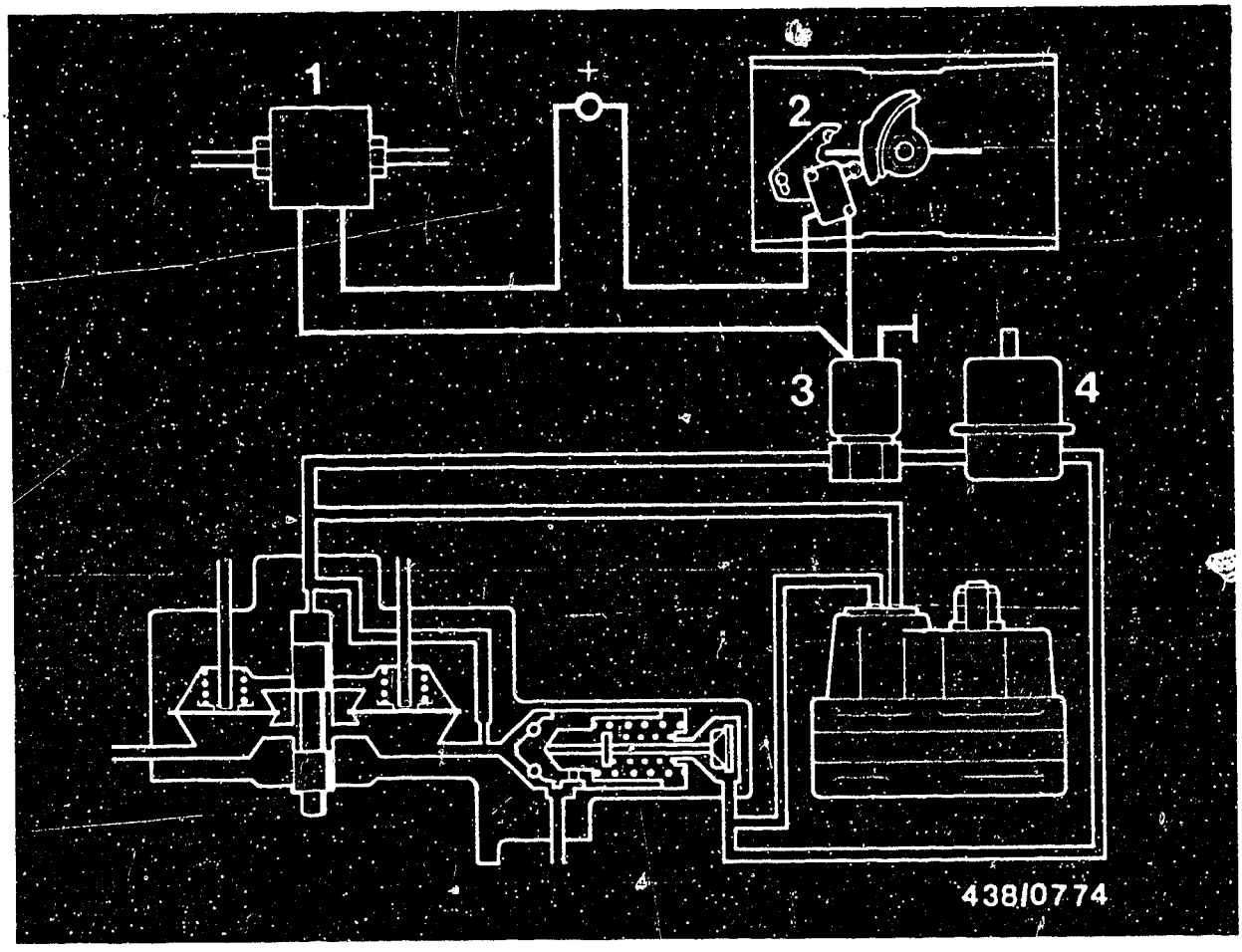
The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.
The anti-tamper device for the air-flow sensor is removed and fitted using special tools (e.g. No. 131 090 from Cartool Co., Hans Schubert KG, Unterer Grasweg 88, D-8070 Ingolstadt).



1 = Speed sensor
2 = Throttle-valve microswitch
3 = Solenoid-operated valve
4 = Pressure regulator

19.4 Testing the full-load enrichment on the 78/79 model

The full-load enrichment is performed by a control-pressure-reduction valve and a downstream pressure regulator. Both components are connected hydraulically in parallel with the warm-up regulator. With the reduction valve open the control pressure is reduced to 2.5 ... 2.9 bar gauge pressure in accordance with the value of the pressure regulator. There is a corresponding enrichment of the mixture.



1 = Speed sensor
2 = Throttle-valve microswitch
3 = Solenoid-operated valve
4 = Pressure regulator

The reduction valve is electrically triggered, depending on the driving condition, by a microswitch on the throttle-valve assembly (switching point 62° throttle-valve angle) or by a speed sensor (switching point above 130 km/h).

Test conditions

- Engine at normal operating temperature.
- Idle adjustment (idle speed, CO concentration) OK.

Testing

Operate the engine at idle speed and connect the CO analyzer.

Actuate the throttle-valve switch by hand. CO concentration must rise to 4.0 ... 6.0 %. If there is no CO rise, test the power supply to the reduction valve with the microswitch pressed. If this is OK, the cause of the trouble lies with the reduction valve or the pressure regulator.

Test the speed-dependent full-load enrichment on the roller-type test stand. At speeds above 130 km/h there must be a minimum voltage of 12 V at the reduction valve.

19.5 Testing the full-load enrichment and acceleration enrichment function on the 80/81 model

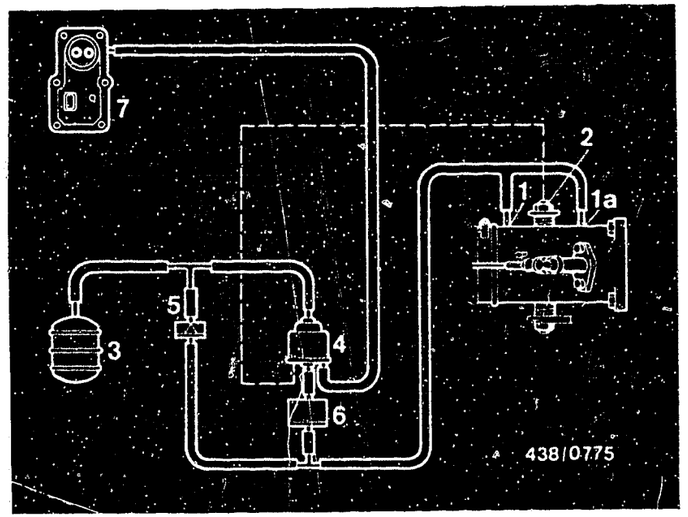
The enrichment is performed by the special warm-up regulator for charge-air-pressure-dependent full-load enrichment.

The intake-manifold-pressure triggering of the warm-up regulator is performed by a special control system whereby there is also acceleration enrichment even during normal naturally-aspirated engine operation.

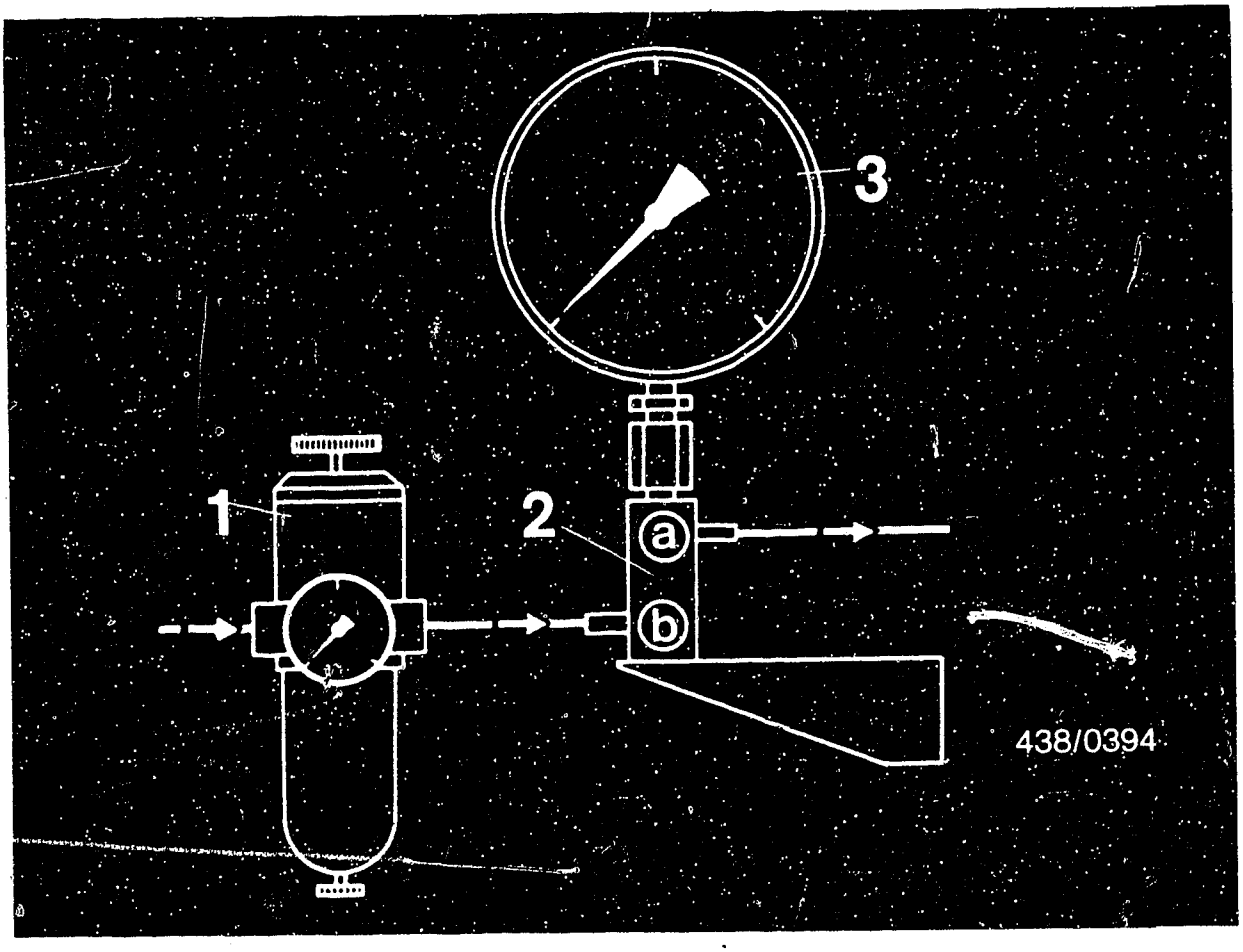
Test conditions:

- Engine at normal operating temperature.
- Idle adjustment (idle speed, CO concentration) OK.
- Warm-up regulator functions OK.

For testing, apply compressed air corresponding to the charge-air pressure to the warm-up regulator through the control system.



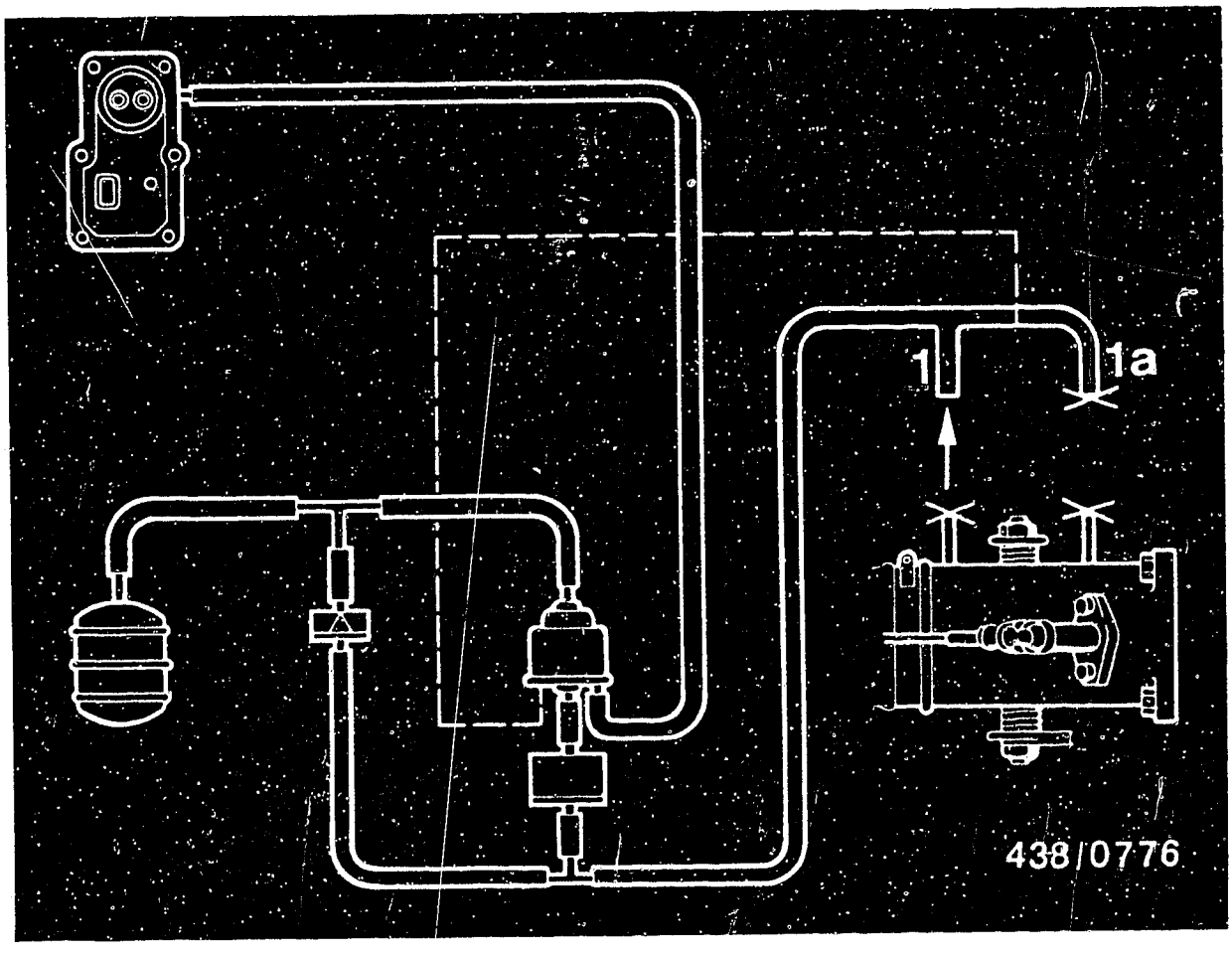
1 = Connection for intake-manifold pressure
1a = 2nd connection for intake-manifold pressure. Only with automatic transmission.
2 = Throttle-valve switch Switching point at 62° throttle-valve opening.
3 = Pressure accumulator
4 = Electric control valve
5 = Non-return valve
6 = Time-delay valve. Only with manually-shifted transmission.
7 = Warm-up regulator



The pressure is applied from the compressed-air mains. The following are required:

1 Pressure regulator (1) with pressure gauge 0 ... 4 bar gauge pressure (commercially available, e.g. Krais und Fritz, Stuttgart, Type No. 104).
1 Adjustment throttle (2) Bosch 0 688 130 132.
Also: pressure gauge (3) 0 ... 1.6 bar gauge pressure, quality class 1.0 (commercially available, e.g. Wika No. 4184).

Note:
The equipment listed is frequently already available in the diesel workshop where it is used for testing the manifold-pressure compensators on diesel injection pumps.



Pull off hose line 1 and connect the pressure hose of the tester to the hose line.
Pull off hose line 1a (if fitted) and seal off.
Operate the engine at idle speed and connect the CO analyzer.
Set the pressure regulator to max. 0.9 bar gauge pressure.
Open the screw plug a of the adjustment throttle.
Using adjustment throttle b set the pressure to max. 0.8 bar gauge pressure. The CO concentration must rise to 4.0 ... 6.0 %. Remove the pressure hose of the tester again. CO concentration drops again to the original idle value.
Actuate the throttle-valve switch by hand. CO concentration must rise again to 4.0 ... 6.0 %.

Leak test on pressure tank

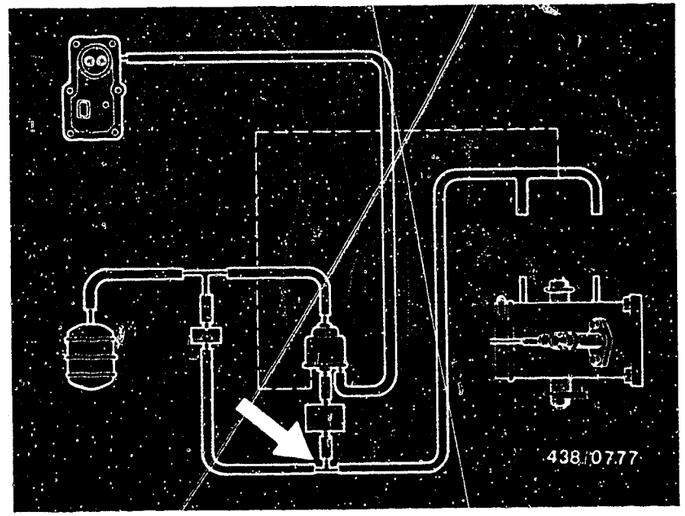
Note:
If there is a leak in the pressure tank or in the rest of the control system there is no acceleration enrichment during heavy acceleration from low engine speeds.

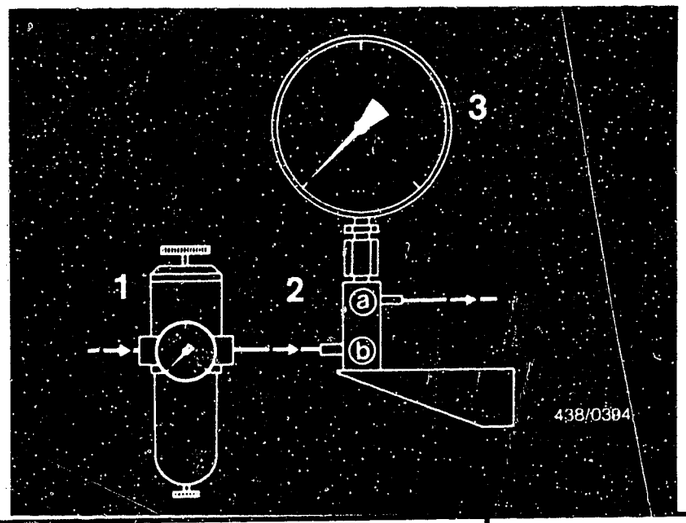
Remove the hose line from the T-piece (arrow) and connect to pressure hose of tester.

Open screw plug a.
Using adjusting screw b, set the pressure to 0.8 bar gauge pressure. Then close the screw plug a and observe the pressure drop.

Test specification:
Minimum pressure after 5 minutes: 0.6 bar gauge pressure

If the leak is excessive, locate the component responsible by pinching off the corresponding hoses.



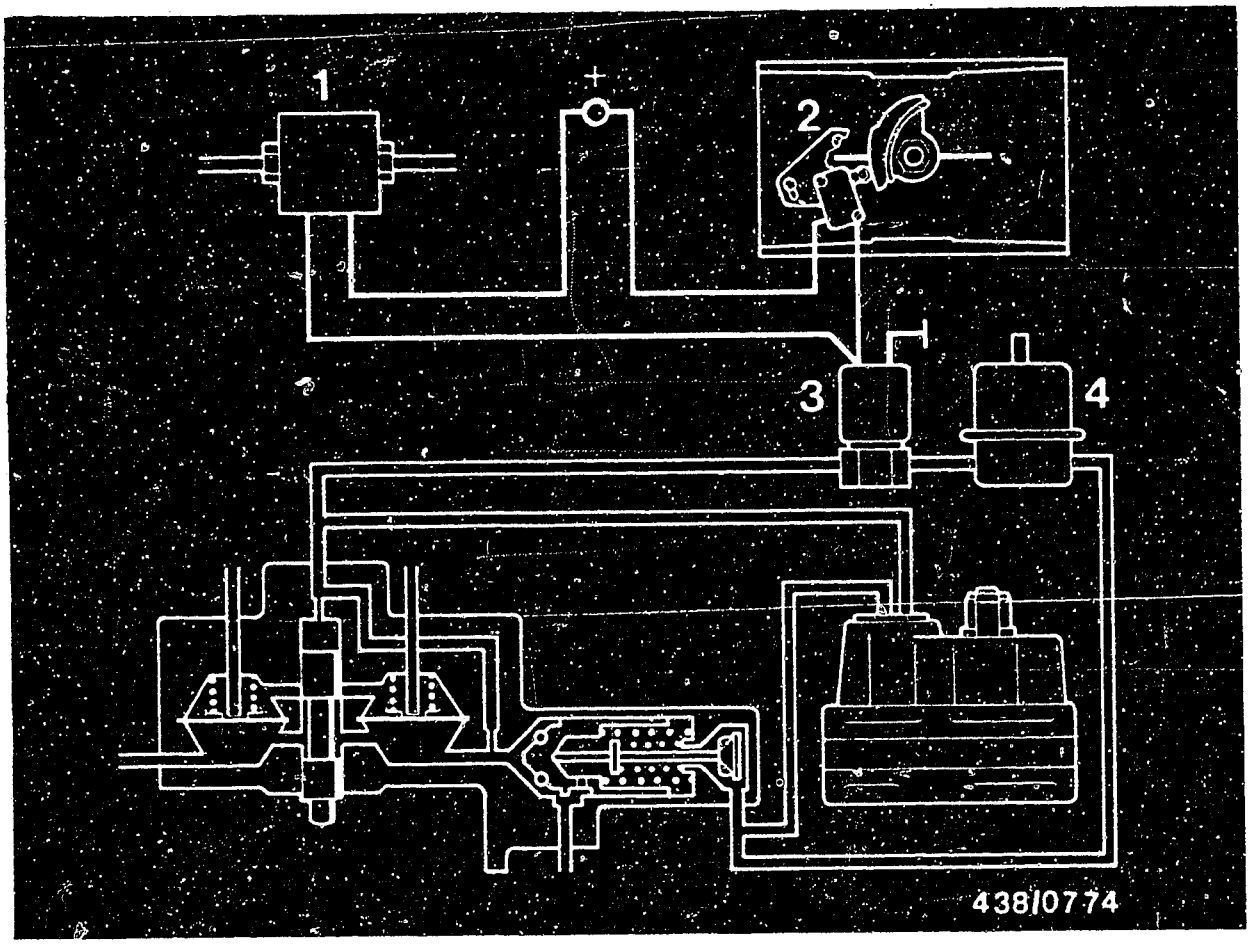


20. ADDITIONAL EQUIPMENT FOR MIXTURE PREPARATION AND EMISSION CONTROL

Depending on the model version, the Saab Turbo was and is equipped with the following additional systems:

- Additional equipment for full-load enrichment on the 1978/1979 model.
- Control system for application of intake-manifold pressure to the warm-up regulator on the 1980/1981 model (full-load and acceleration enrichment).
- Engine-speed monitoring through electronic engine-speed relay and charge-air pressure monitoring through charge-air pressure switch.
- Throttle-valve closing damper.
- Time-delay valve for intake-manifold-pressure-dependent timing advance of the ignition distributor on the Sweden model.
- Exhaust-gas recirculation on the Sweden model.

In the following, this additional equipment is described together with the installation position of the components.

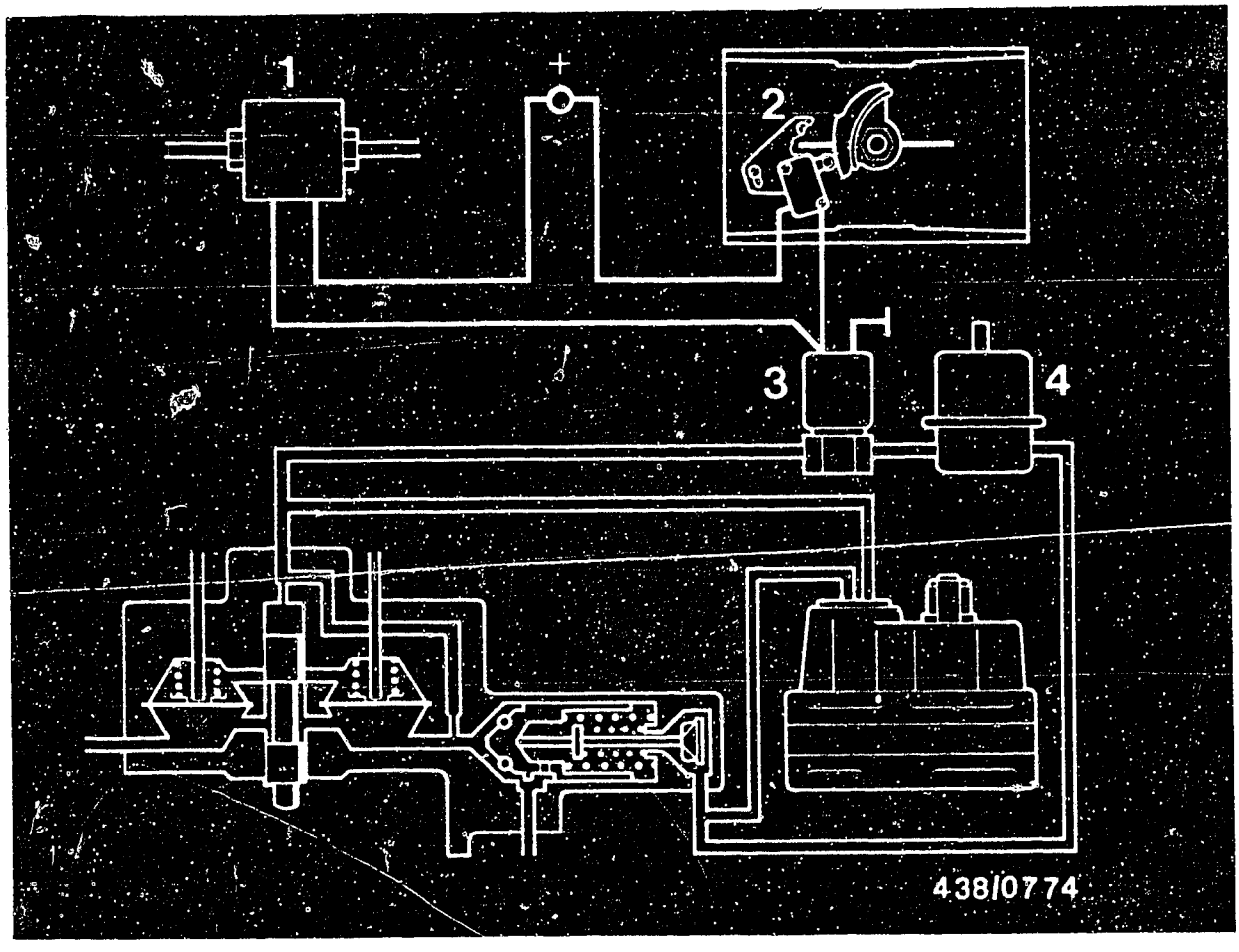


1 = Speed sensor
2 = Throttle-valve microswitch
3 = Solenoid-operated valve
4 = Pressure regulator

20.1 Full-load enrichment on the 1978/1979 model

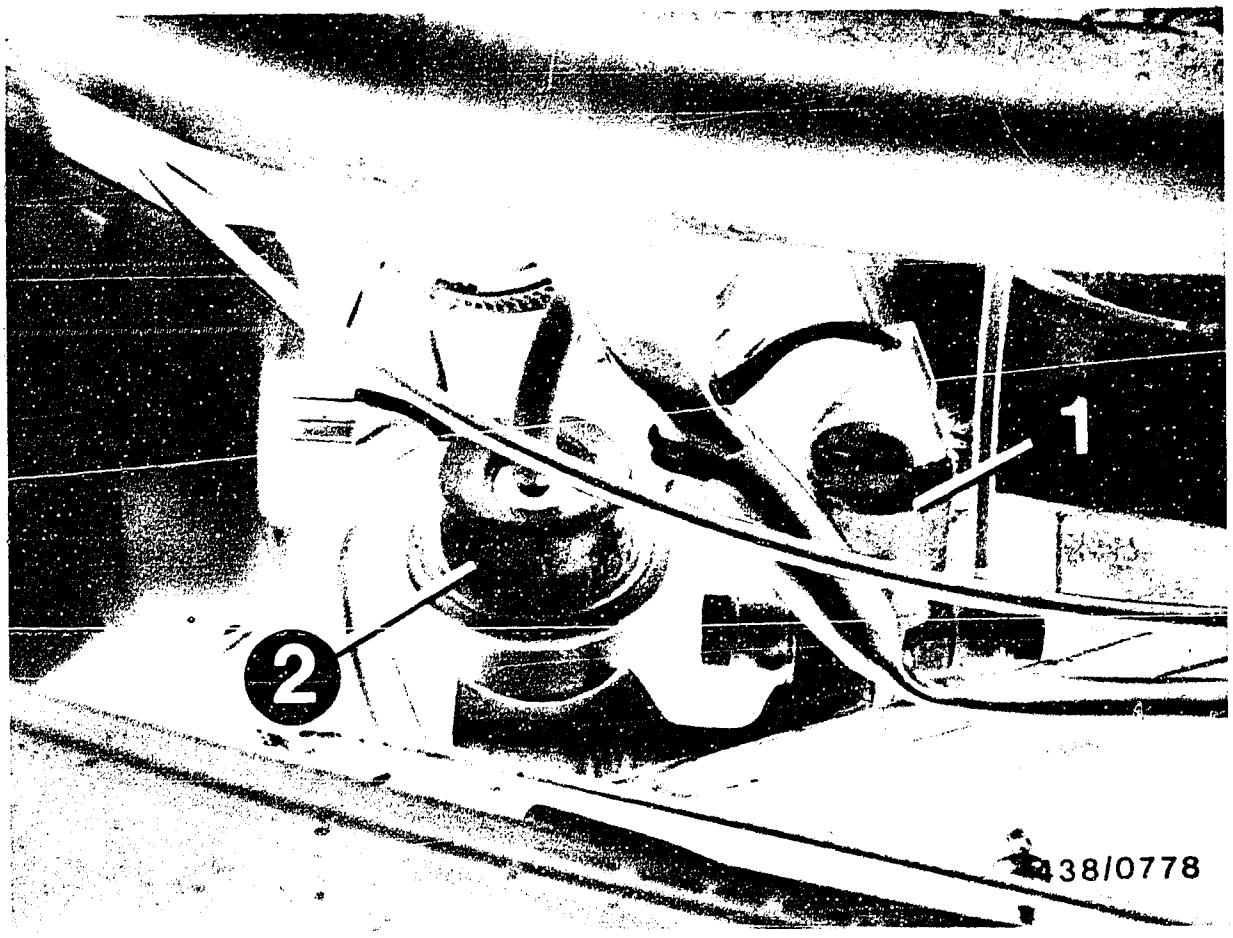
The full-load enrichment is performed by two different sensors, a solenoid-operated valve and a pressure regulator.

Operation:
A solenoid-operated valve (3) connected in parallel with the warm-up regulator in the control-pressure circuit opens at full load so that, with the warm-up regulator shut off, the control pressure is reduced, thus enriching the mixture. A pressure regulator (4) downstream of the solenoid-operated valve has a fixed setting and limits the pressure reduction to 2.5 ... 2.9 bar gauge pressure.

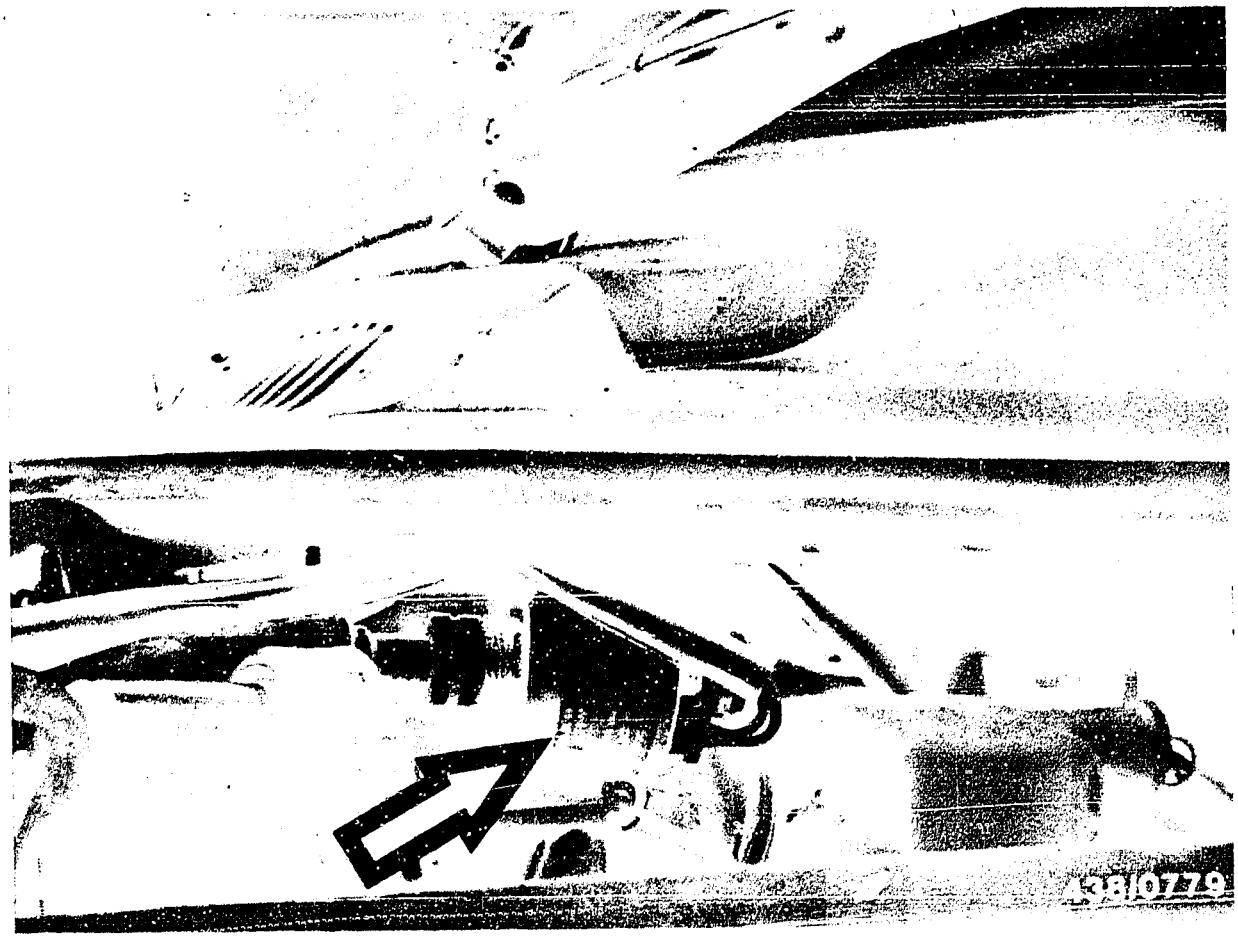


1 = Speed sensor
2 = Throttle-valve microswitch
3 = Solenoid-operated valve
4 = Pressure regulator

The solenoid-operated valve is triggered, depending on the driving condition, by a microswitch on the throttle-valve assembly (2) or by a speed sensor in the speedometer drive (1).
The microswitch switches at a throttle-valve opening angle above 62°. The speed sensor switches at speeds above 130 km/h.
If in doubt, this full-load enrichment system should be tested under all circumstances since if there is no full-load enrichment this can lead to engine damage. This test is carried out with the engine running and is, therefore, best combined with the idle adjustment.



Solenoid-operated valve (1) and pressure regulator (2) for full-load enrichment (control-pressure reduction) on the 1978/1979 model



Speed sensor for full-load enrichment (control-pressure reduction) on the 1978/1979 model.

Throttle-valve microswitch for full-load enrichment (control-pressure reduction) on the 1978/1979 model.

Switching point setting:

62° throttle-valve opening angle.

20.2 Full-load enrichment and acceleration enrichment on the 1980/1981 model

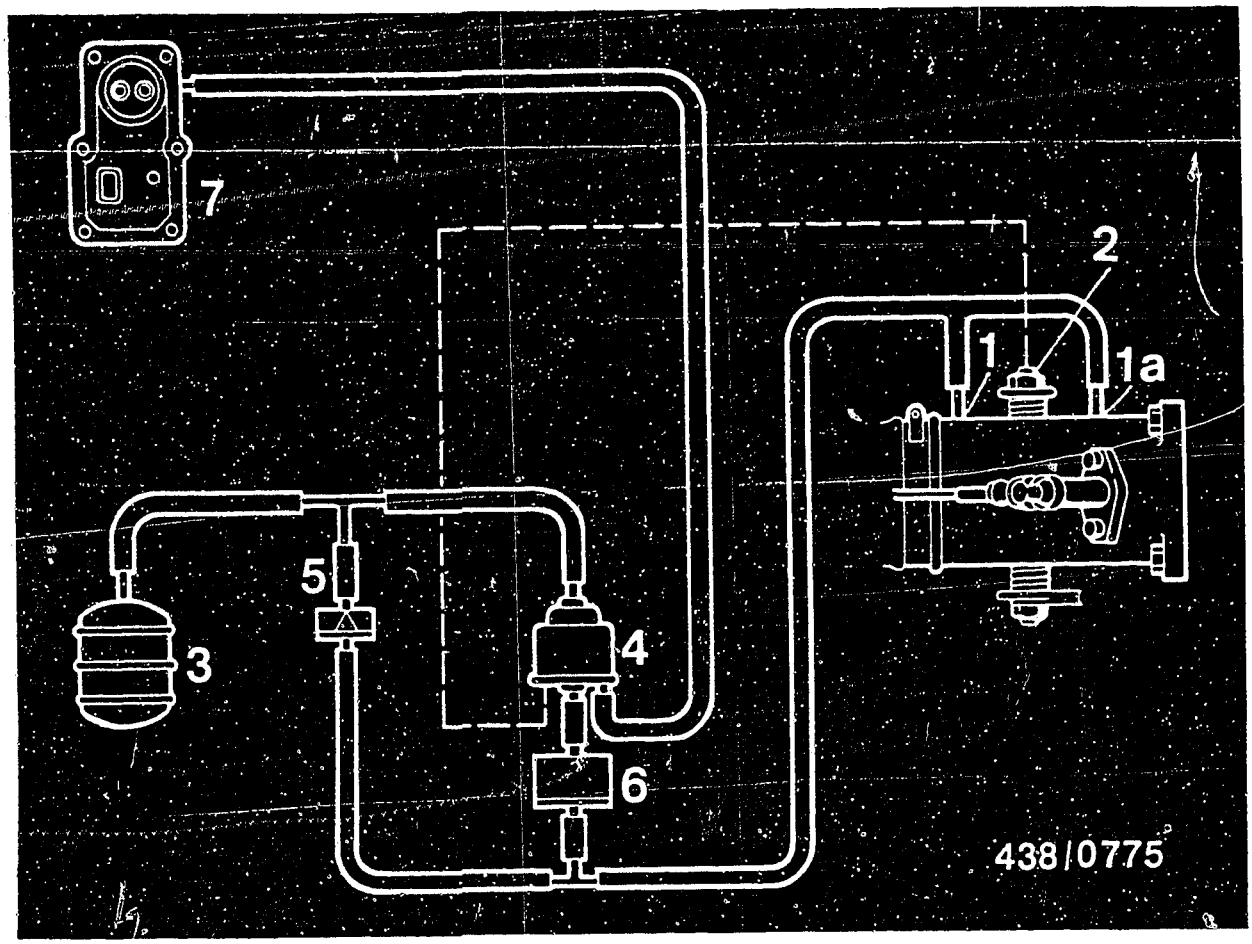
Enrichment is performed by the special warm-up regulator for charge-air-pressure-dependent full-load enrichment.

The operation of this warm-up regulator is basically the same as that of the known version for intake-manifold-pressure-controlled full-load enrichment. However, enrichment (control-pressure reduction) does not take place during normal, naturally-aspirated engine operation, but only when there is charge-air pressure (gauge pressure) in the intake manifold.

Full-load enrichment guarantees the internal cooling of the engine during extended full-load operation. Furthermore, there is additional acceleration enrichment during fast acceleration as a result of the immediate control-pressure reduction.

These enrichments are not necessary in the case of brief high loading or in the case of slow acceleration. Nor are these enrichments desirable for reasons of fuel economy and low exhaust emissions.

For this reason, the intake-manifold pressure is applied to the warm-up regulator through the special control system described in the following.



1 = Connection for intake-manifold pressure (before throttle valve)
1a= 2nd connection for intake-manifold pressure, with restriction bore. Only with automatic transmission.
2 = Throttle-valve switch. Switching point at 62° throttle-valve opening.
3 = Pressure accumulator
4 = Electric control valve
5 = Non-return valve
6 = Time-delay valve. Only with manually-shifted transmission.
7 = Warm-up regulator

Intake-manifold-pressure control system for warm-up regulator

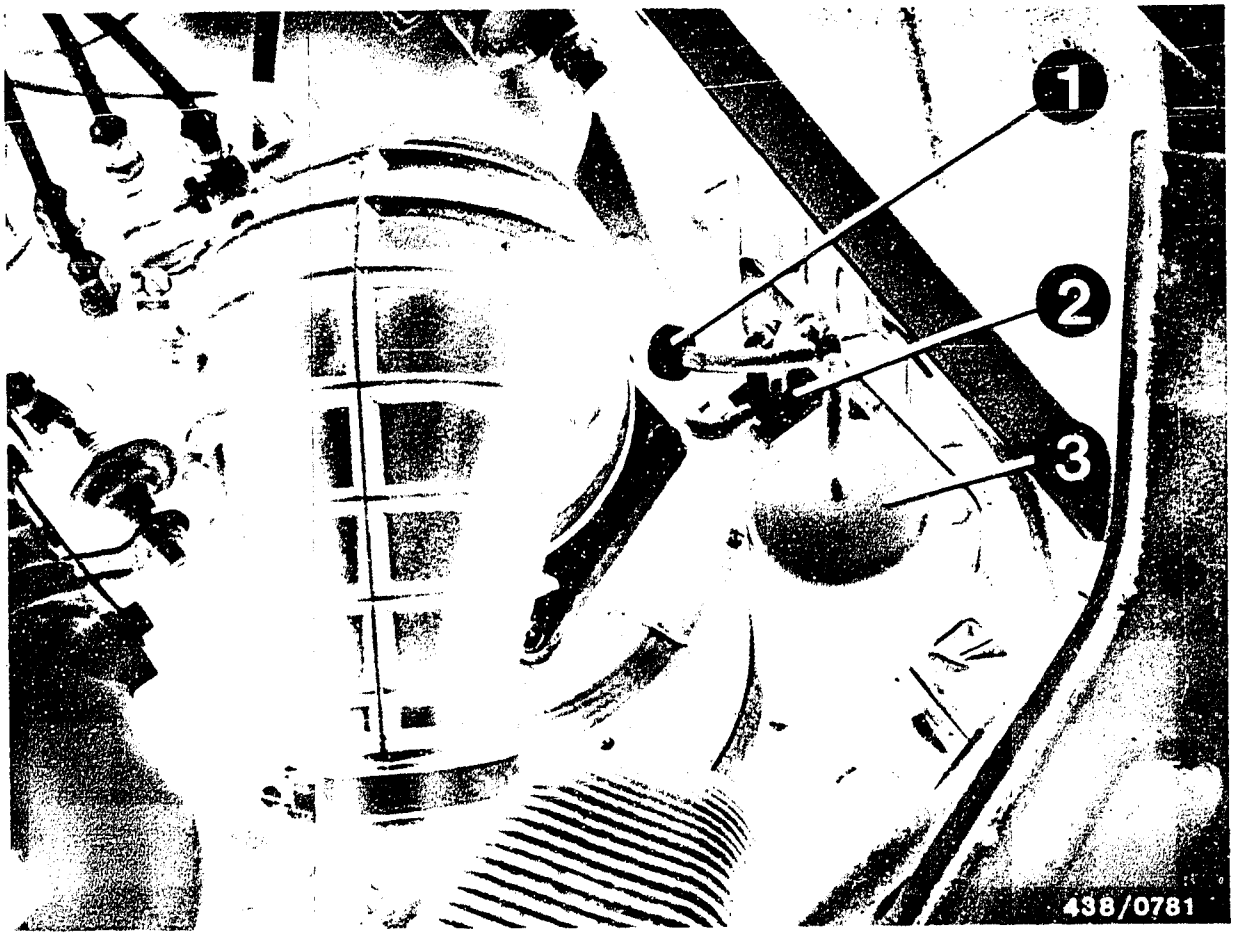
- High load on engine, throttle-valve opening below 62°:

  The application of pressure to the warm-up regulator (enrichment) is from the intake manifold via the time-delay valve (6) and the unactuated control valve (4) (the two adjacent connection ports are open).
  The time-delay valve (6) delays this pressure buildup by approx. 6 seconds, i.e. no acceleration enrichment, delayed full-load enrichment.

- High load, throttle-valve opening above 62°:

  During turbocharged engine operation, the charge-air pressure is constantly present in the pressure accumulator (3) via the non-return valve (5) and is stored there for an extended period of time.

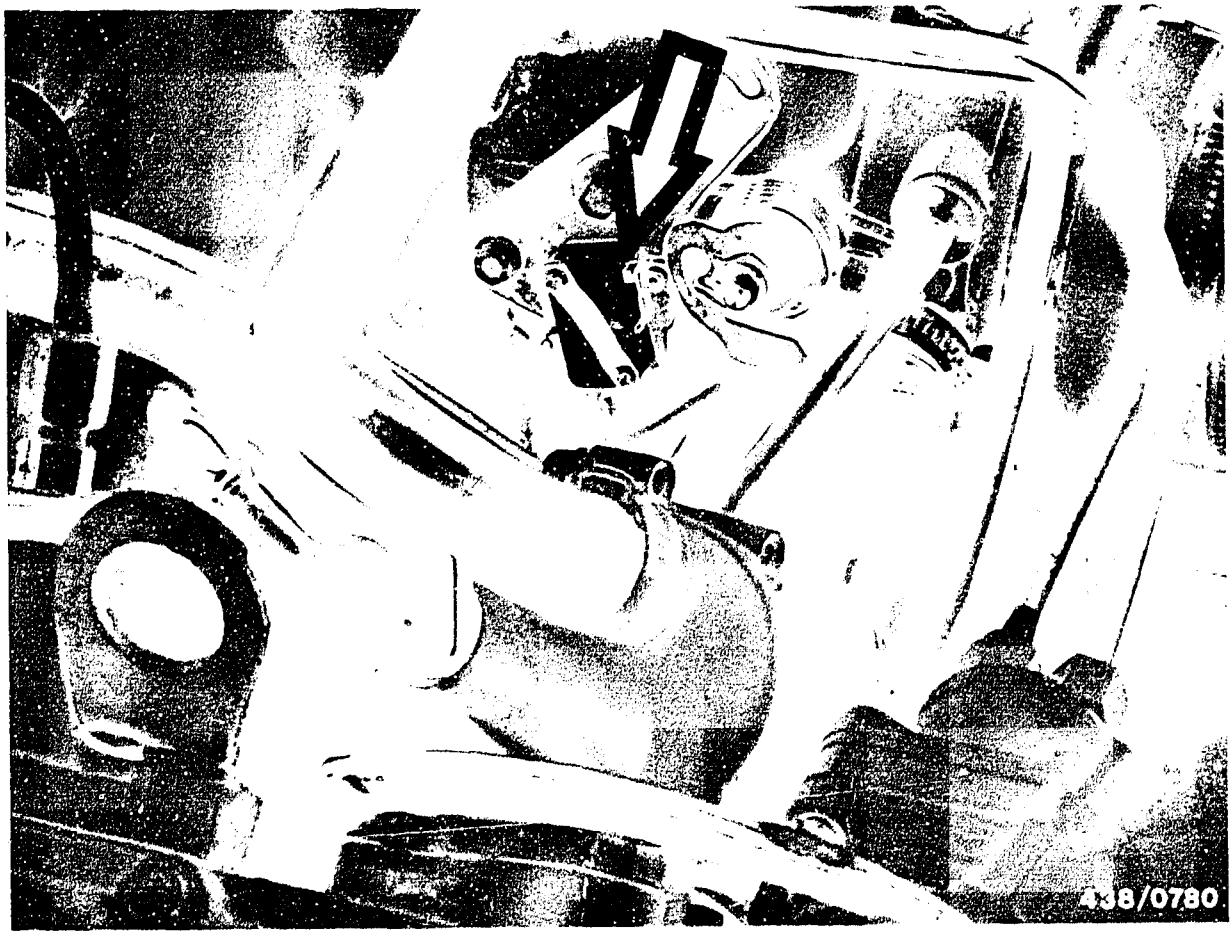
  If, after temporary operation at low load, the throttle valve is again opened fully (above 62°), the electric control valve is opened through the actuation of the throttle-valve switch (2). Pressure is applied immediately to the warm-up regulator from the pressure accumulator through the control valve. The enrichment (control-pressure reduction) for acceleration and full load therefore takes place even before the charge-air pressure has been reached by the turbocharger.



1 = Non-return valve
2 = Electric control valve
3 = Pressure accumulator

The components of the control system are mounted on the left-hand inside wheel box.

The time-delay valve (not visible in the picture) is positioned underneath the pressure accumulator.



Throttle-valve microswitch for enrichment system on the 1980/1981 model

Switching point setting:

62° throttle-valve opening angle.

If in doubt, the control system should be tested under all circumstances since if there is no full-load enrichment this can lead to engine damage.

This test is carried out with the engine running and is, therefore, best combined with the idle adjustment. See Coordinates G1.

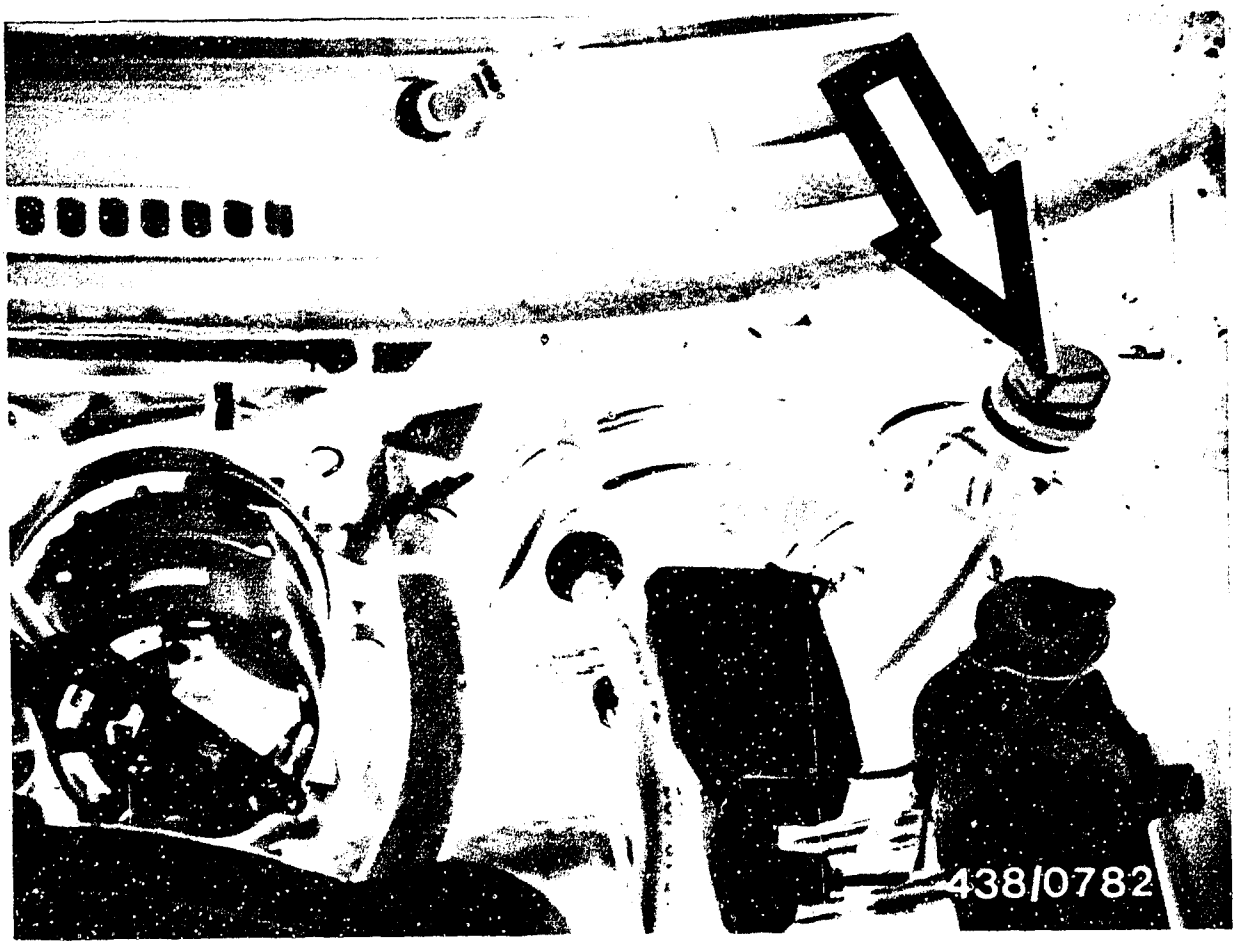
20.3 Engine-speed monitoring/overload protection

In order to monitor the charge-air pressure, a pressure switch is connected on the intake manifold. If the charge-air pressure is too high (e.g. if there is a defect on the wastegate), this pressure switch cuts the power supply to the relay of the electrical safety circuit and thus cuts the power supply to the electric fuel pump.

The electronic relay of the safety circuit also serves as an engine-speed limiter.

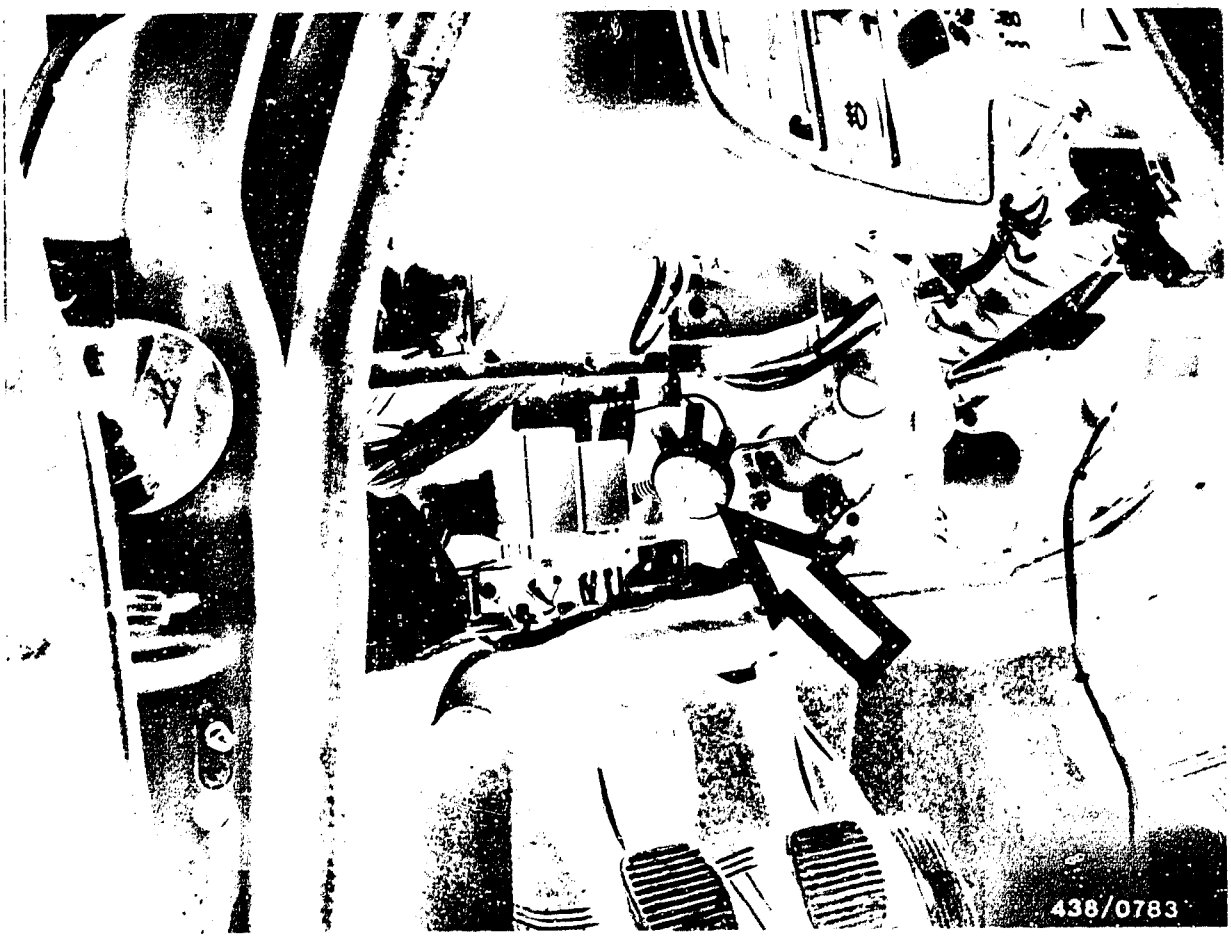
Cut-in speed: approx. 30 min^{-1}

Cut-out speed: 5900 ... 6200 min^{-1}



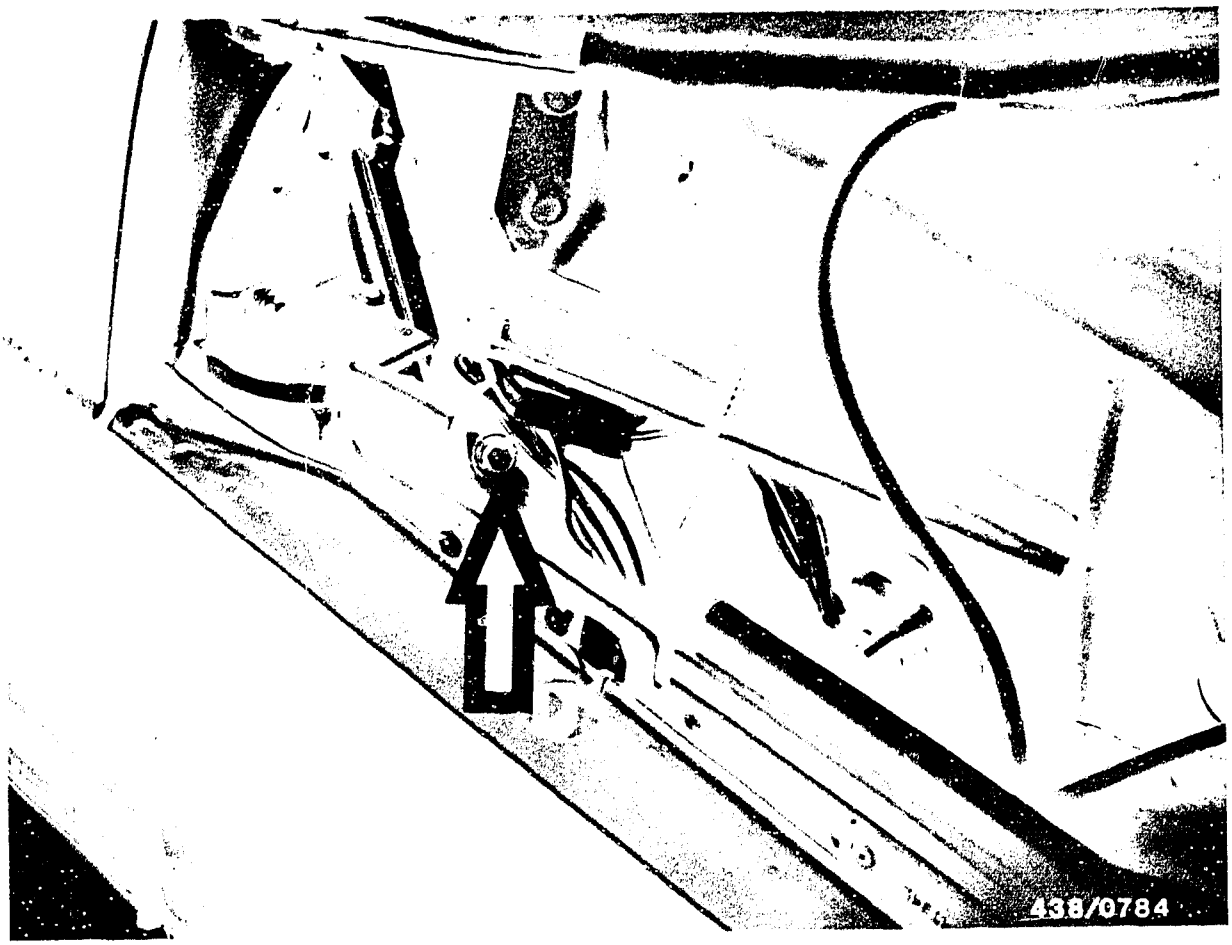
. Charge-air-pressure switch on the 1978/1979 model.

Connection to intake manifold through hose line.



As of the 1980 model the charge-air-pressure switch is located under the instrument panel (arrow). In the picture it is removed from the bracket located behind the two relays.

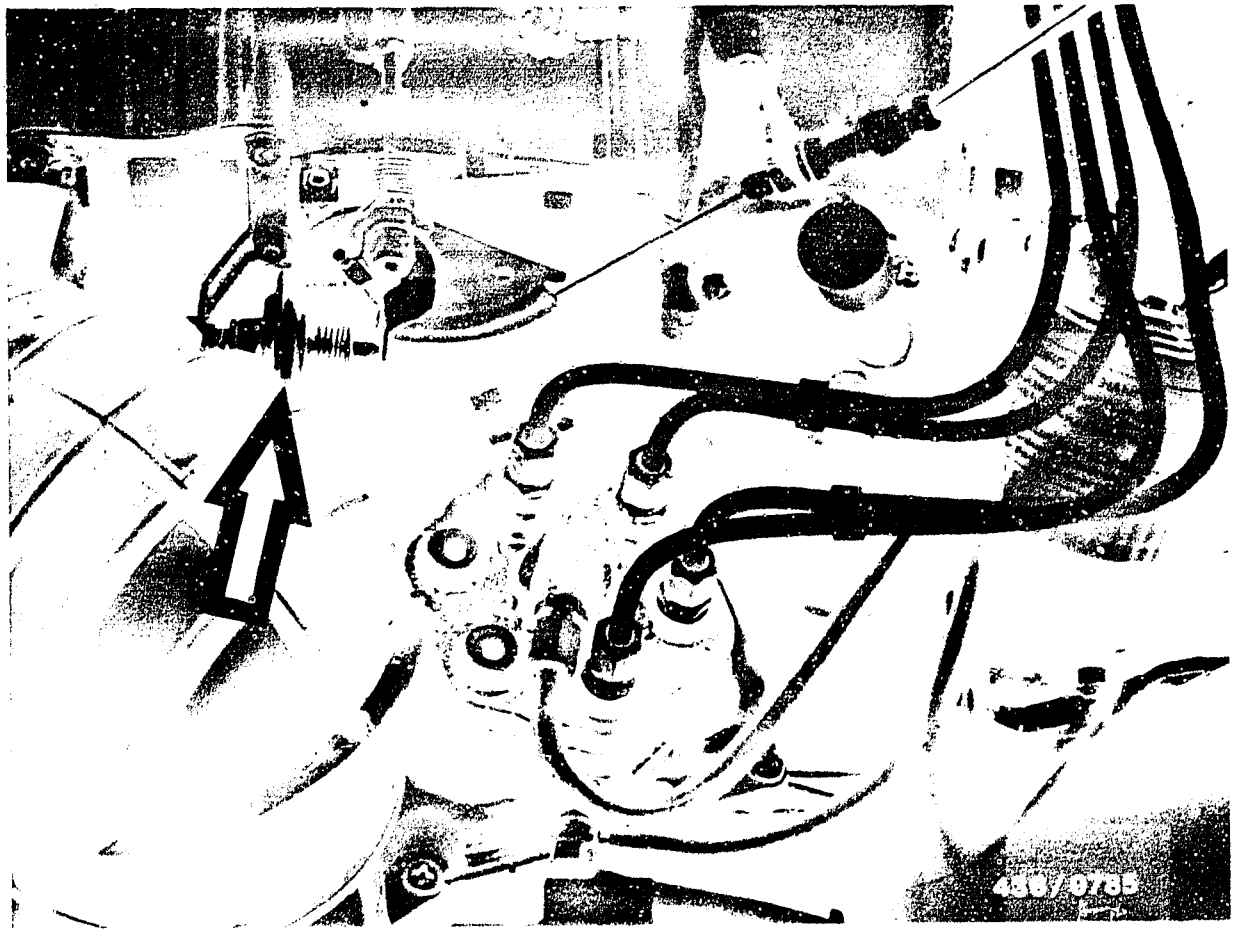
For access to the switch, remove the complete instrument panel bottom trim. When doing this, pay attention to the information on the following coordinate.



In order to remove the instrument panel bottom trim, unscrew the following three hexagon screws:

- The hexagon screw behind the ashtray (pull out ashtray).
- The two outer fastening screws (arrow). These are accessible from the wheel box side and are covered with sealing putty (picture shows the screw on the right-hand vehicle side).

  After installation, it is essential to replace the sealing putty so that no splash water can penetrate into the vehicle interior.

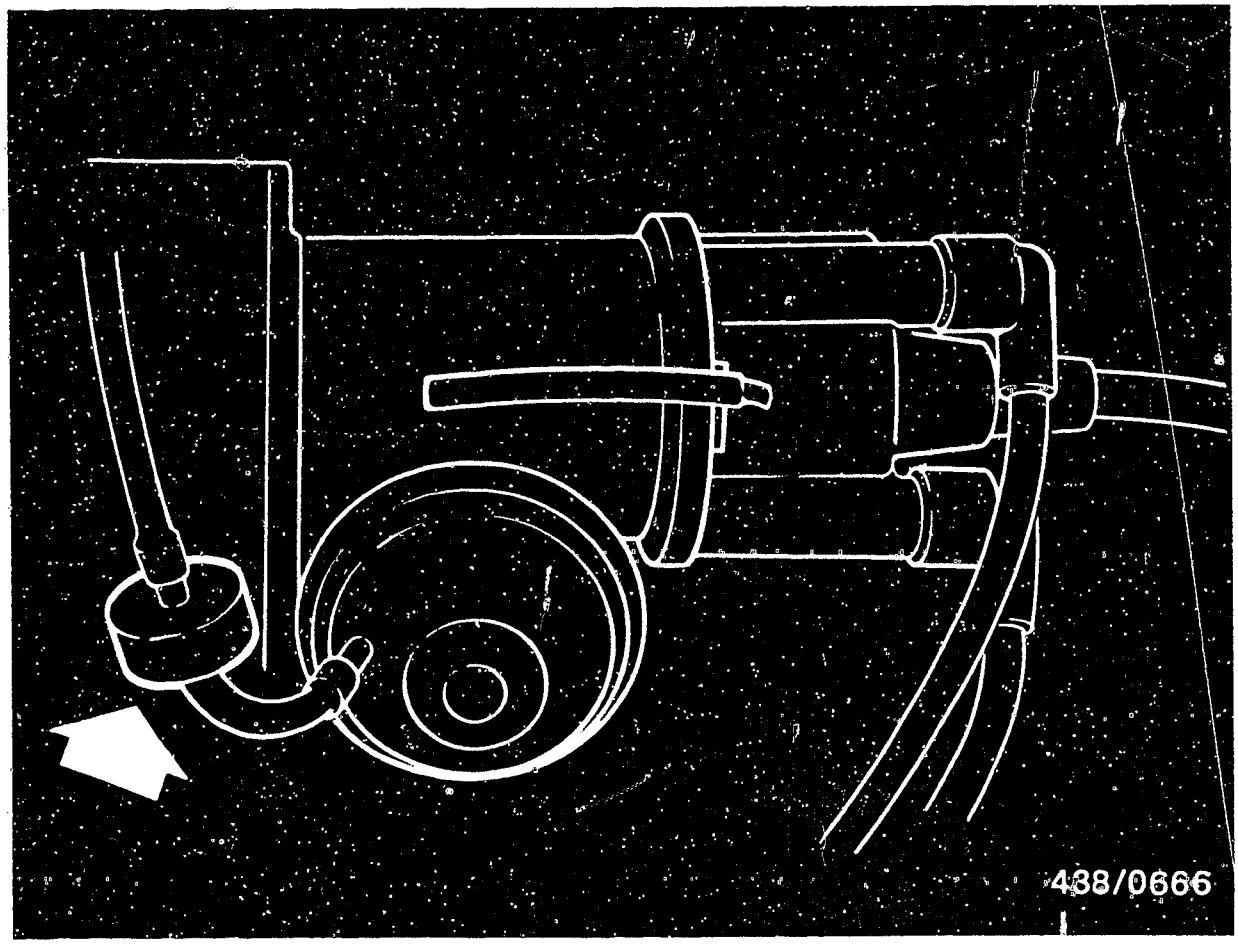


20.4 Throttle-valve closing damper

A throttle-valve closing damper (arrow) is installed on the throttle-valve assembly.

Closing time of the throttle valve with correct adjustment of the damper, correct idle adjustment and engine at normal operating temperature:

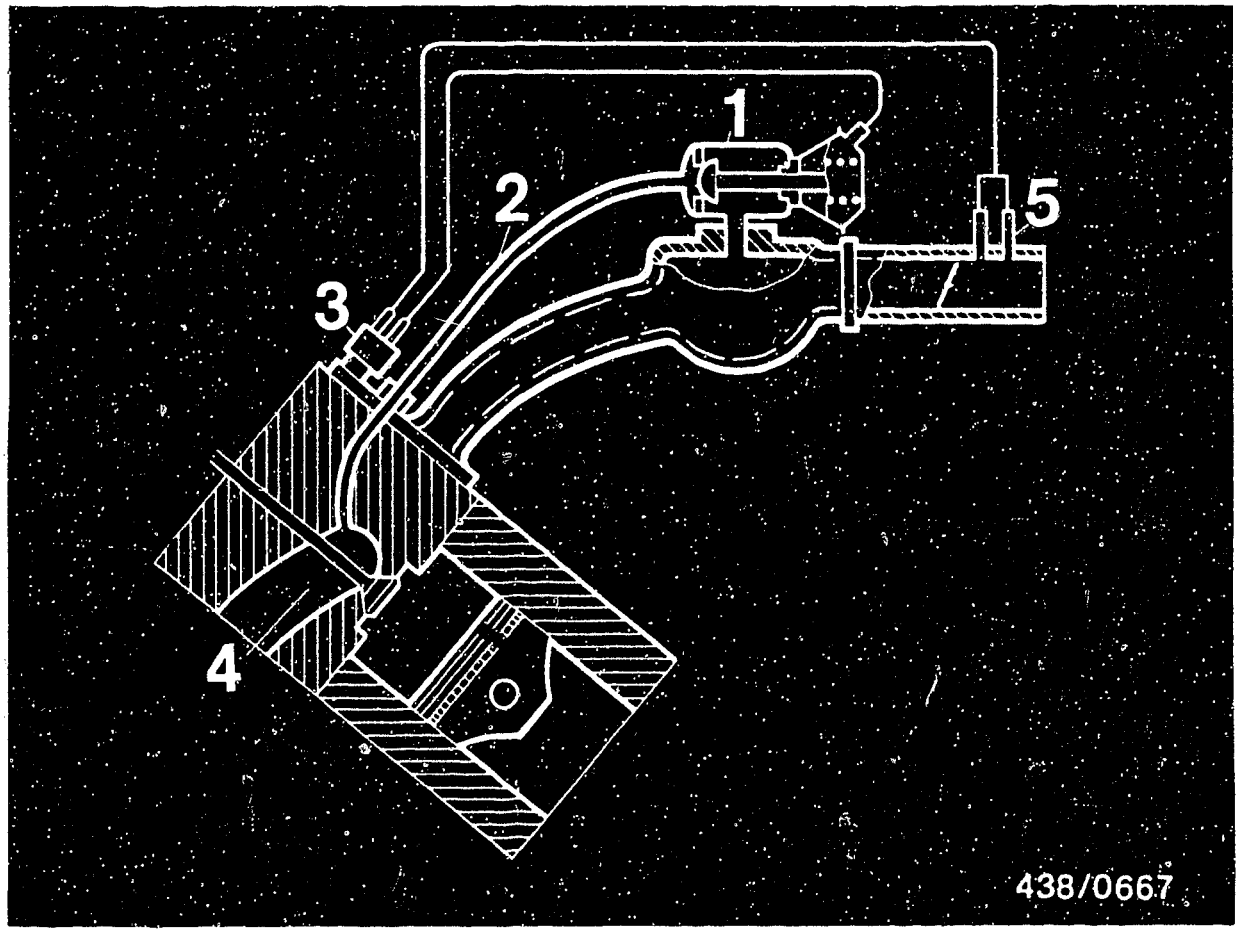
from n = 3000 min^{-1} ... 875 min^{-1}: 3 ... 6 seconds.



Vehicles of the Sweden version are equipped with a time-delay valve for the vacuum timing advance of the ignition distributor.
Various versions of valve are used with various delay times. They must be distinguished by the colour marking (surface on the side of the hose fitting to the ignition distributor):

Manually-shifted transmission:	Colour green, delay time 20 sec.
Automatic transmission:	Colour white, delay time 6 sec.

As a result, during acceleration, there is a delay in the intake-manifold-pressure-dependent ignition timing advance.



1 = Exhaust-gas recirculation valve
2 = Exhaust pipe
3 = Thermostat valve
4 = Exhaust port
5 = Intake-manifold connections

20.5 Exhaust-gas recirculation in the Sweden model with automatic transmission

Vehicles of the Sweden version with automatic transmission are equipped with exhaust-gas recirculation. The recirculation of some of the exhaust gases (taken from the exhaust port of cylinder 2) into the intake manifold reduces the combustion temperature, thus lowering the emission of oxides of nitrogen.
System operation is dependent on engine temperature and intake-manifold pressure. The system only operates at engine temperatures above approx. 38°C and only at part load.

21. K-JETRONIC WITH LAMBDA CLOSED-LOOP CONTROL

21.1 General remarks on models with lam. cl.-l. con.:

Since the start of the series in 1978, the Saab 99/900 Turbo models have been supplied in the USA with additional lambda closed-loop control. From 5.85, these vehicles with lambda closed-loop control have also been available in some European markets (D, CH).

With regard to K-Jetronic, these models fundamentally correspond to the versions without lambda closed-loop control, with the following exceptions:

* Fuel distributor in 4-cylinder version and special lambda design.

* Basic-version warm-up regulator, without additional functions.

* Test specifications partly changed.

* Additional lambda closed-loop control.

Testing and repair of the lambda closed-loop control system is described in the following additional section, together with a description of additional systems in conjunction with lambda closed-loop control.

Please note: all test specifications of the K-Jetronic, also those for lambda versions, are compiled in Line A of this microcard and shall not be repeated in this section. This section deals exclusively with the lambda-specific special features of the K-Jetronic.

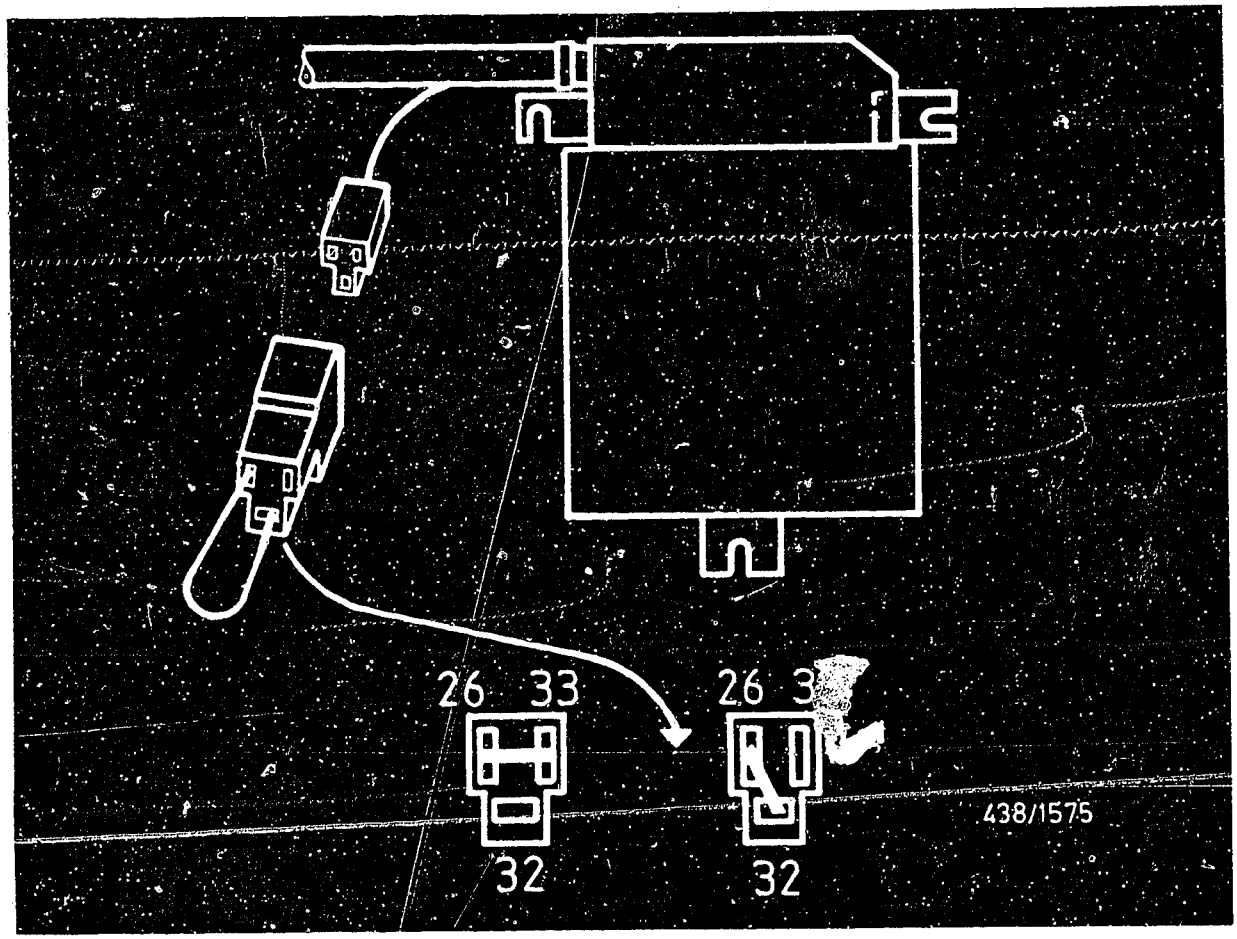
The detailed trouble-shooting section of this microcard (Lines B...G) is equally valid for the lambda versions; in this case, too, the lambda-specific test specifications are to be taken from Line A.

21.2 Version of lambda closed-loop control in the Saab 99/900 Turbo

* Control-unit version, scope of functions:

Part no.:	0 280 800 004	- 78/79 mod. (5.77...5.79)
	0 280 800 025	- 80 mod.(6.79...5.80)
	0 280 800 035	- 81 mod. (6.80...5.81)
	0 280 800 054	- 82/85 mod. (6.81...5.85)
	0 280 800 070	- 86 mod. (from 6.85)

Control-unit versions ...035, 054 and 070 are designed for external coding. Certain control-unit functions may be adapted to current requirements by appropriate connection of the control-unit inputs.



In the vehicles with control units ...035 and 054, this connection is made by jumpering pins 26 and 32 (California version) or 26 and 33 (Federal USA version). Jumpering is by means of a 3-pin plug at a special wiring-harness output in the vicinity of the control unit (see diagram).

In vehicles with control unit ...070, there is generally only one jumper between pins 26 and 31, connected internally in the wiring harness.

21.3 Additional equipment for mixture preparation and emission control as of the 1981 model:

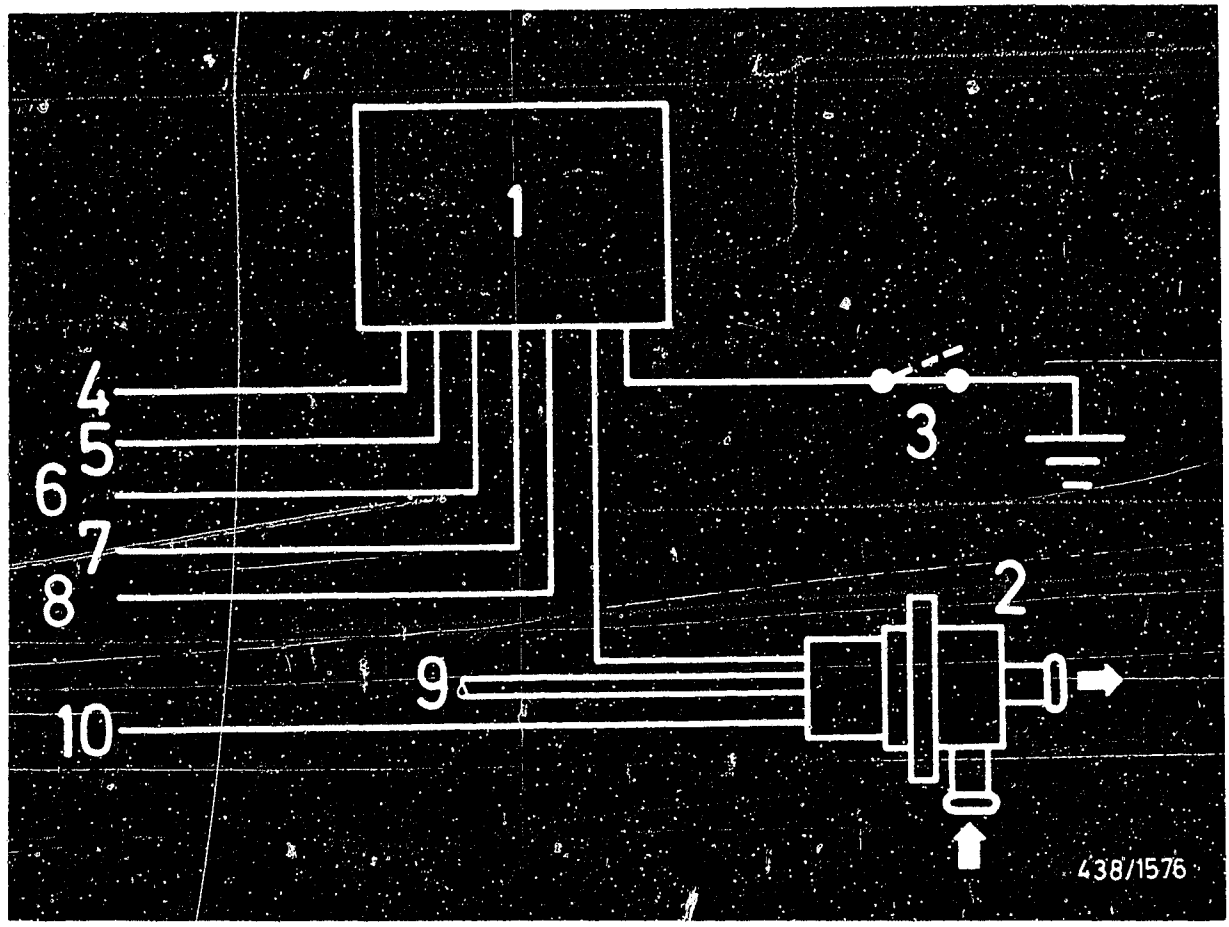
The following additional equipment for models without lambda closed-loop control is also fitted in lambda vehicles:

* Exhaust-gas recirculation

* Time-delay valve for intake-manifold-pressure-dependent timing advance of the ignition distributor

* Throttle-valve closing damper

* Engine-speed monitoring through electronic engine-speed relay and charge-air pressure monitoring through charge-air pressure switch.



1 = engine-speed relay
2 = Overrun-cutoff valve
3 = Throttle-valve switch
4 = To time-lag relay "acceleration enrichment"
5 = To terminal 87 - relay, safety circuit
6 = To control unit lambda closed-loop control, pin 12
7 = Terminal 31
8 = To terminal 1 - ignition
9 = Vacuum control line to intake manifold
10= To terminal 15

In addition, lambda vehicles with manually shifted transmission as of the 82 model are equipped with overrun fuel cut-off.

The system consists of an overrun-cutoff valve (connected as a bypass around the K-Jetronic air-flow sensor), a speed switch and a throttle-valve switch for idle-speed detection.

The overrun-cutoff valve is actuated by the intake-manifold vacuum; application of the vacuum is controlled by a solenoid valve integrated in the valve.

Overrun-cutoff is actuated under the following conditions:

* Engine speed above 1450 min^{-1}

* Throttle-valve switch closed (i.e. throttle valve closed).
  Switching point of throttle-valve switch: as close as possible to 0° throttle-valve angle.

* Engine temperature over 49°C. If the engine is cold, the signal from the speed switch is suppressed by a thermo-switch (in the coolant circuit).

* "Acceleration enrichment" function not active (time-lag relay for acceleration enrichment in rest position).

During the overrun-cutoff phase, the lambda control unit receives a ground signal from the speed switch via pin 12 and switches the lambda closed-loop control system to control with fixed on-off ratio (t_4).

Enrichment functions:

Up to 1983 model:

* Warm-start enrichment:
  Implemented if engine temperature is over approx. 45°C by means of pulsating additional injection through the start valve. Drive by pulse relay.

* Post-start enrichment:
  Implemented if engine is warm (over approx. 45°C) and if engine has been shut-down for more than approx. 30 minutes before starting. Enrichment by means of pulsating additional injection through start valve, functional control by time-lag relay.

* Acceleration enrichment:
  If engine is cold, up to approx. 45°C, pulsating additional injection through start valve. Triggered by pressure-operated snap-action switch and pulse relay.

* Full-load enrichment:
  Implemented if throttle valve is fully open (more than approx. 62°C) and engine speed over approx. 3000 min^{-1}.
  Triggered by throttle-valve switch and speed switch. Enrichment is by increasing the lambda on/off ratio to a fixed value (t_3).

From 1984 model:

* Cold-start enrichment:

  1. Enrichment function by start valve dependent on thermo-time switch.

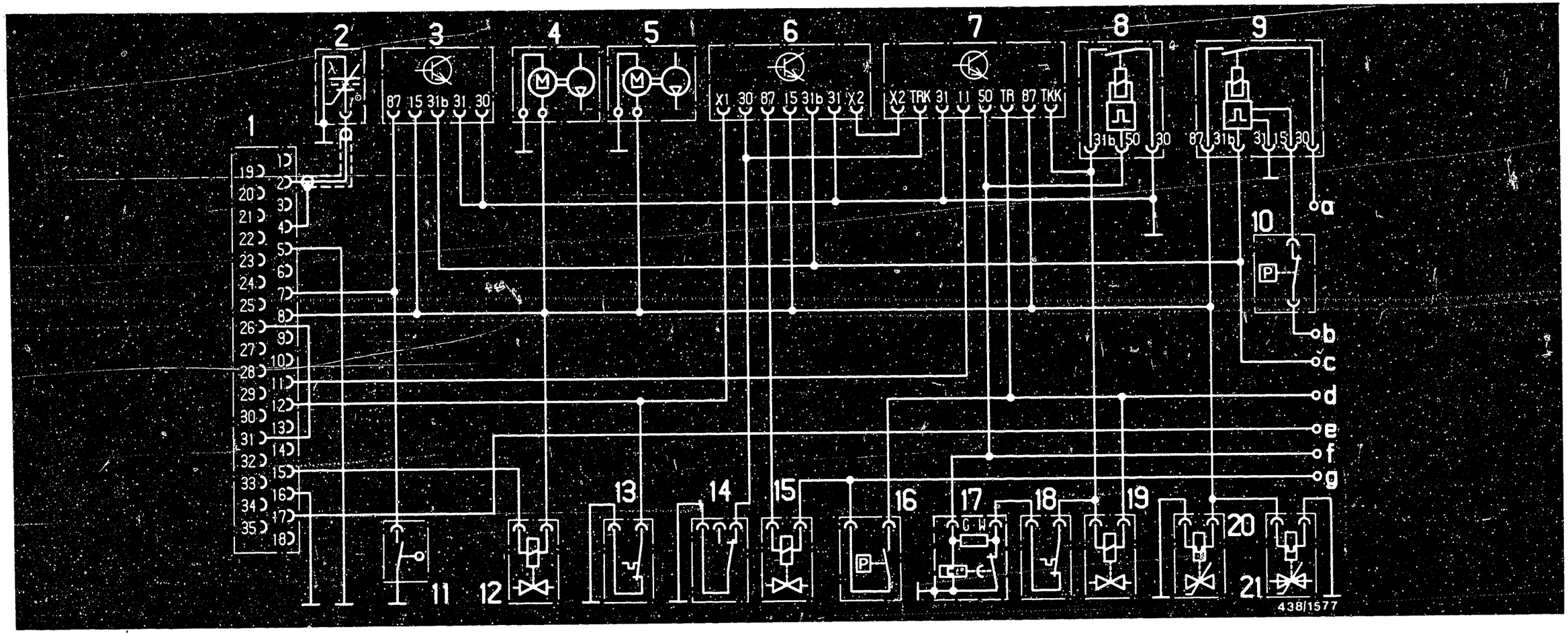
  2. Additional enrichment if engine temperature is up to approx. 25°C by increasing the lambda on/off ratio to a fixed value (t_5).

* Warm-start enrichment:
  As for cold start, but start-valve function pulsating, driven by warm-start relay.

* Acceleration enrichment:
  If engine temperature is less than approx. +20°C through start valve, driven via pressure-operated snap-action switch, thermo-time switch, thermo-switch (25°C).

Above approx. +25°C enrichment is by increasing the lambda on/off ratio to a fixed value (t_5), determined by the time-lag relay. This function is implemented for up to max. 2 minutes after starting only.

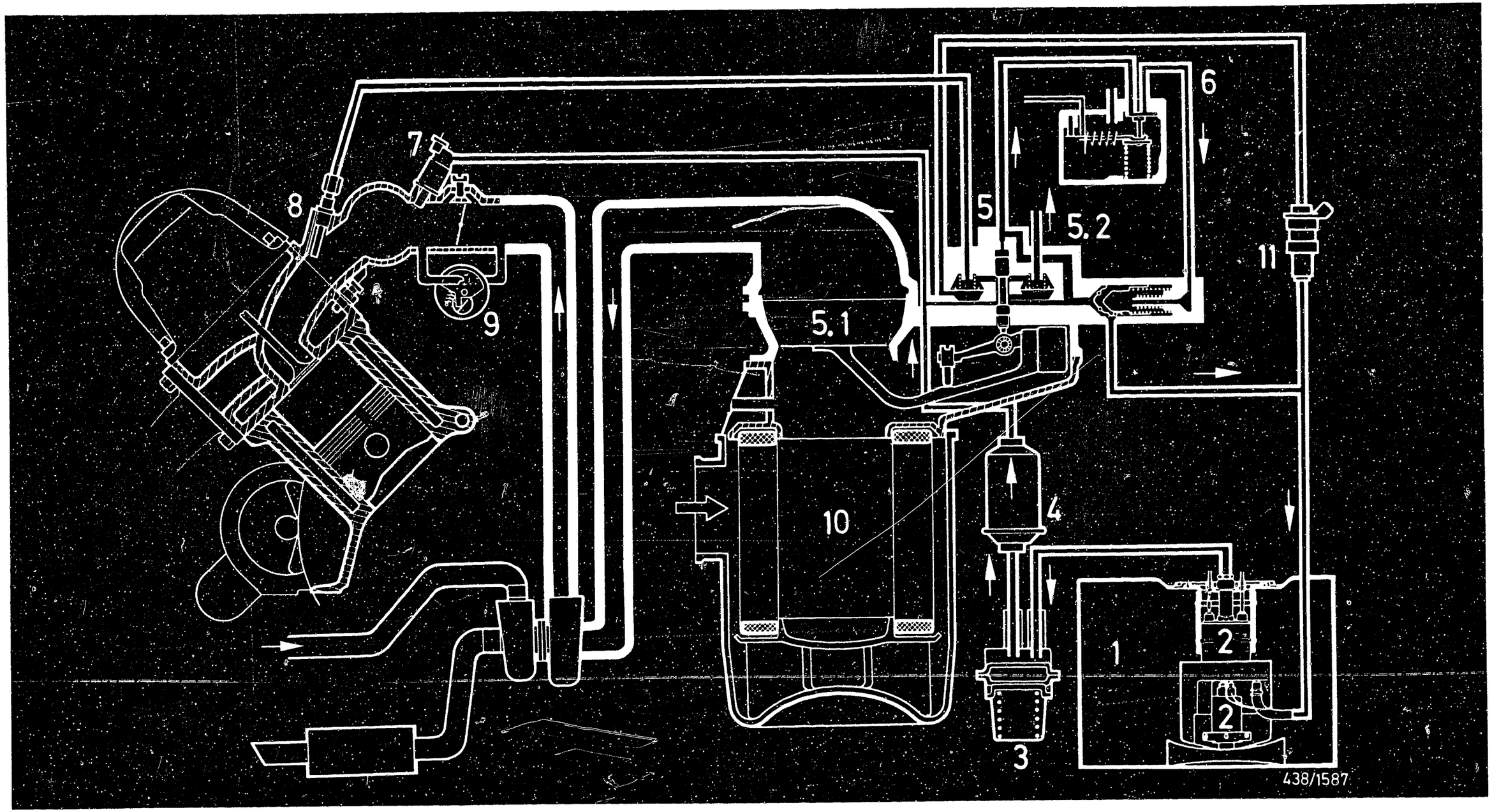
* Full-load enrichment (only until 1985 model):
  As for model up to 1983, but cut-in speed approx. 4000 min^{-1}.



1 = Control unit, lambda cl.-l. con.
2 = Lambda sensor
3 = engine-speed relay, full-load enrichment (only until 1985 model)
4 = Electric fuel pump
5 = Pre-supply pump
6 = engine-speed relay, overrun cut-off
7 = Time-lag relay, starting enrichment (via lambda on/off ratio)
8 = Warm-start relay
9 = Fuel-pump relay
10 = Charge-air-pressure switch
11 = Throttle-valve switch, full load
12 = Timing valve
13 = Thermo-switch +45°C (from 84 model)
14 = Throttle-valve switch, idle
15 = Solenoid valve, overrun cut-off
16 = Pressure-operated snap-action switch, acceleration enrichment
17 = Thermo-time switch
18 = Thermo-switch +25°C
19 = Start valve
20 = Warm-up regulator
21 = Auxiliary-air device

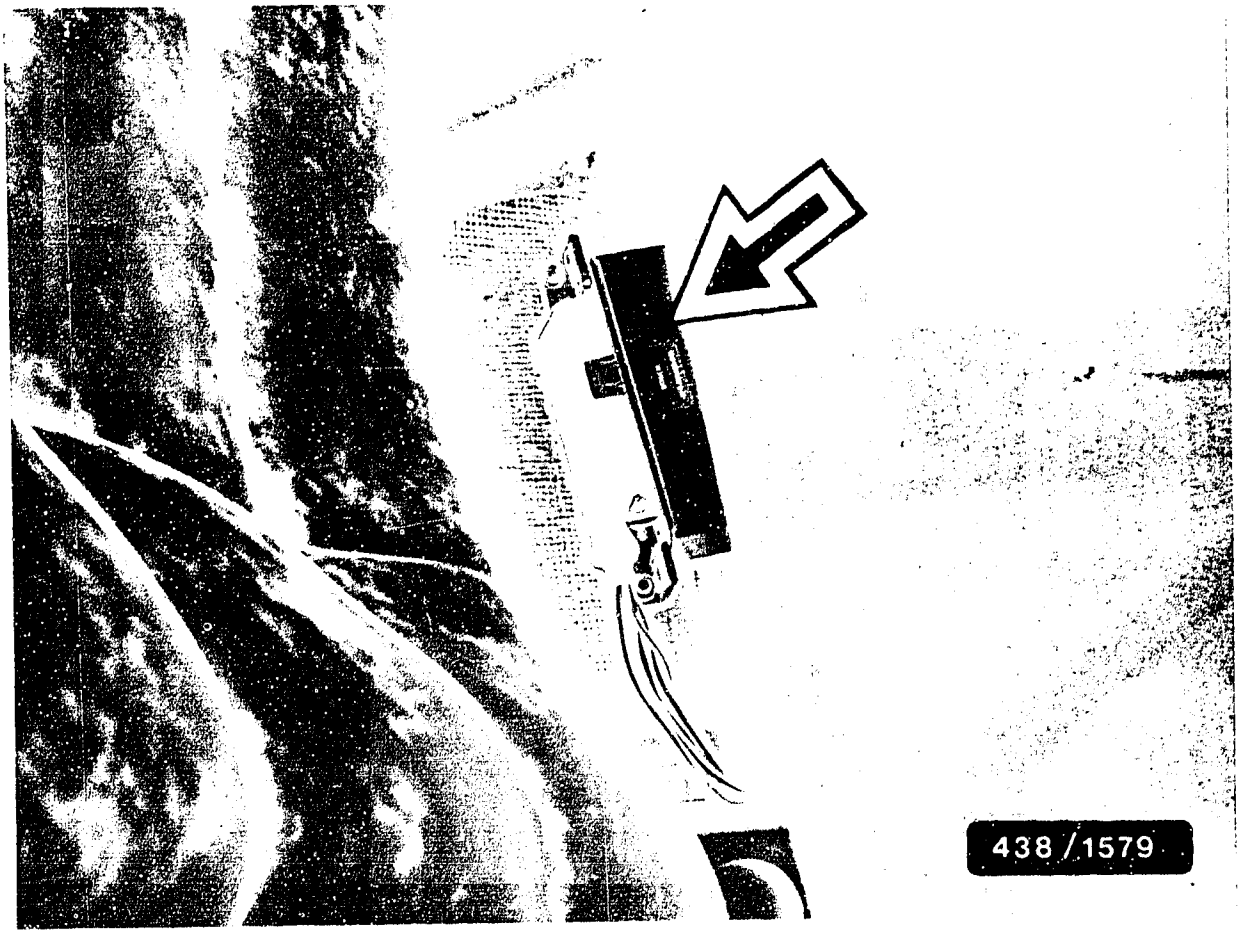
a = Terminal 30
b = Terminal 15
c = TD signal
d = Terminal 16
e = Lambda measurement output
f = Terminal 50
g = Terminal 54

21.4 ELECTRICAL TERMINAL DIAGRAM WITH SAFETY CIRCUIT OF ELECTRIC FUEL PUMP



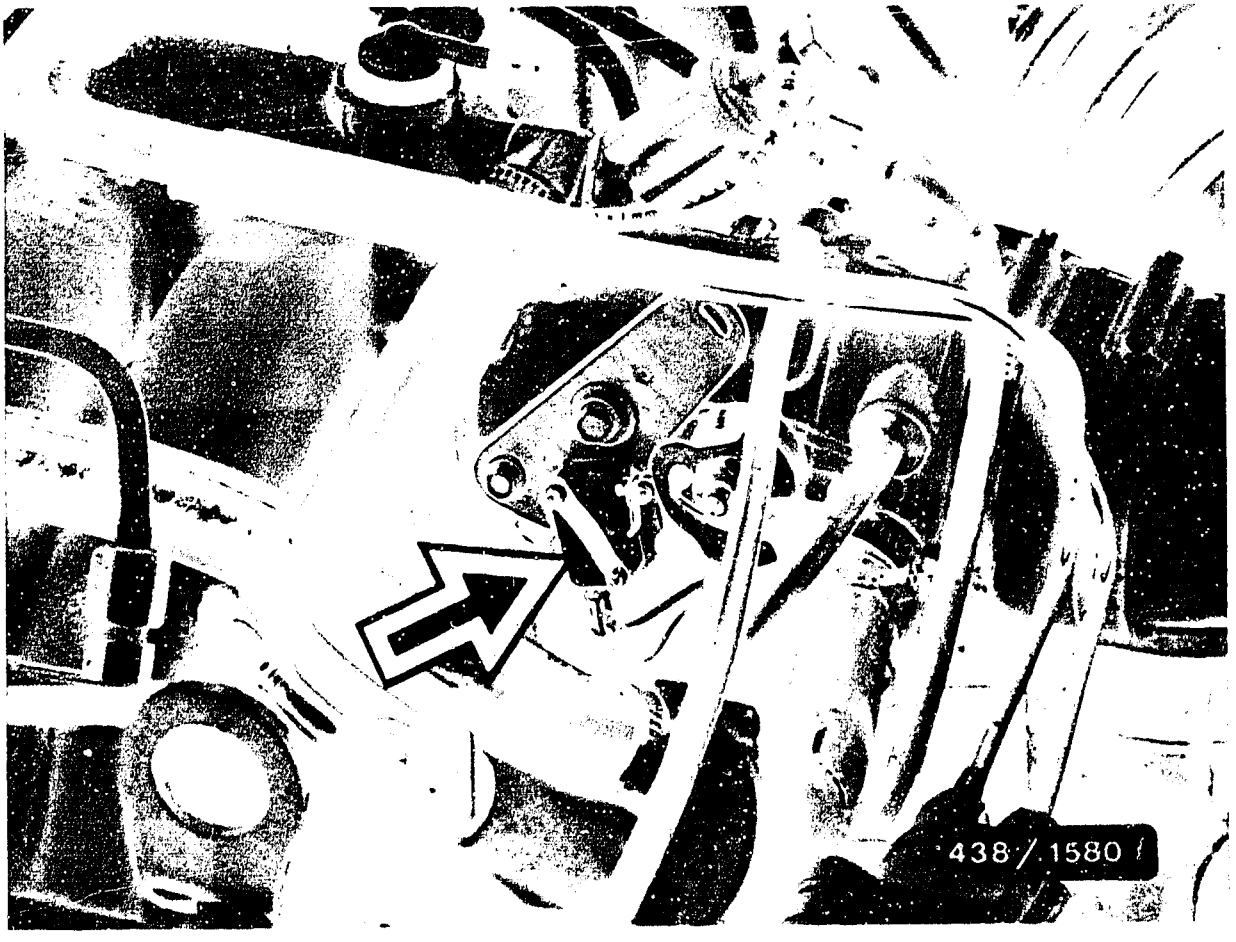
1 = Fuel tank
2 = Electric fuel pump
as of 84 model additional
pre-supply pump (below)
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Warm-up regulator
7 = Start valve
8 = Injection valves
9 = Auxiliary-air device
10 = Air filter
11 = Timing valve

21.5 FUEL-LINE DIAGRAM K-JETRONIC WITH LAMBDA CLOSED-LOOP CONTROL



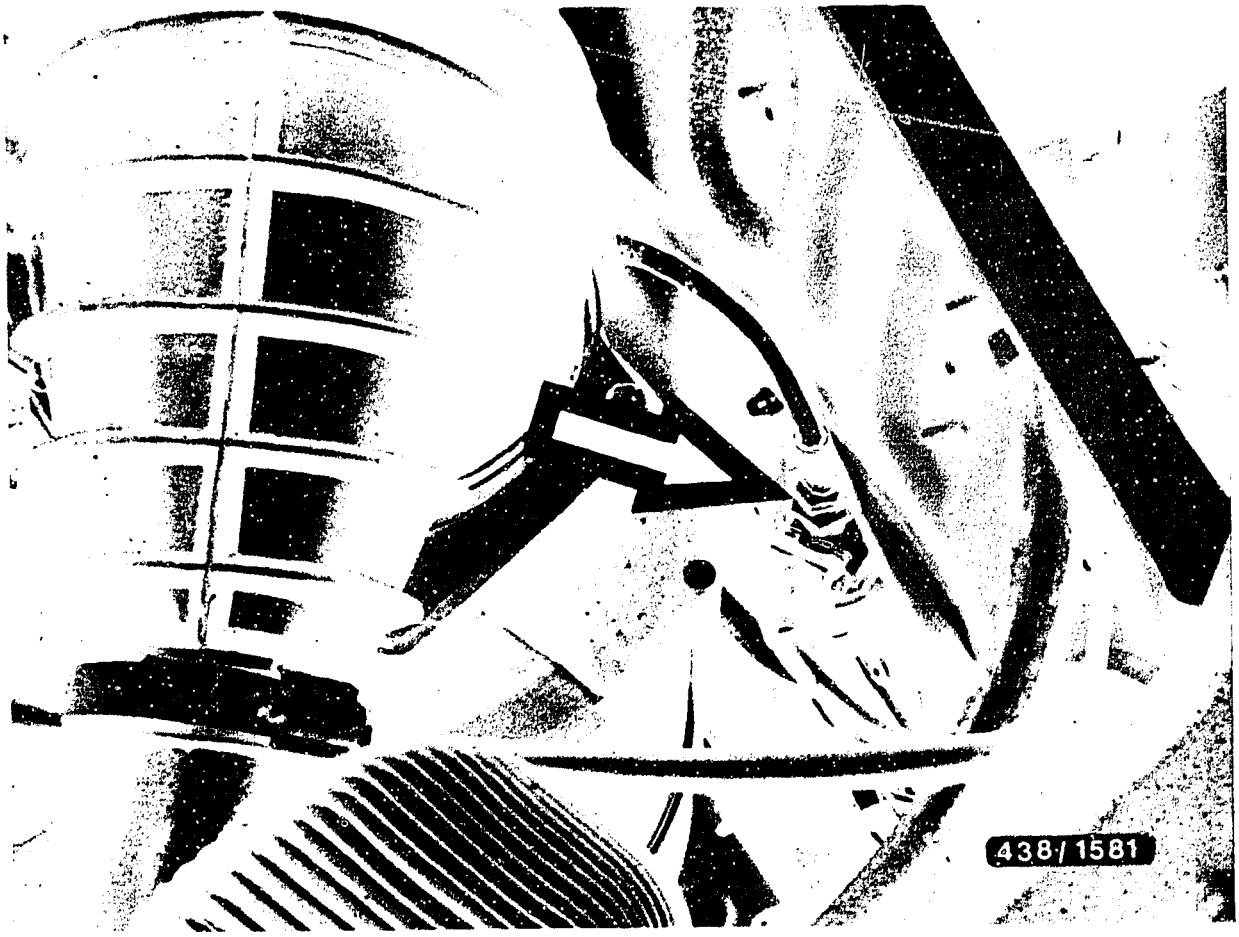
21.6 Installation position of components for lambda closed-loop control:

The electronic control unit is located beneath the rear seat bench, on the right-hand side as viewed from behind the vehicle.

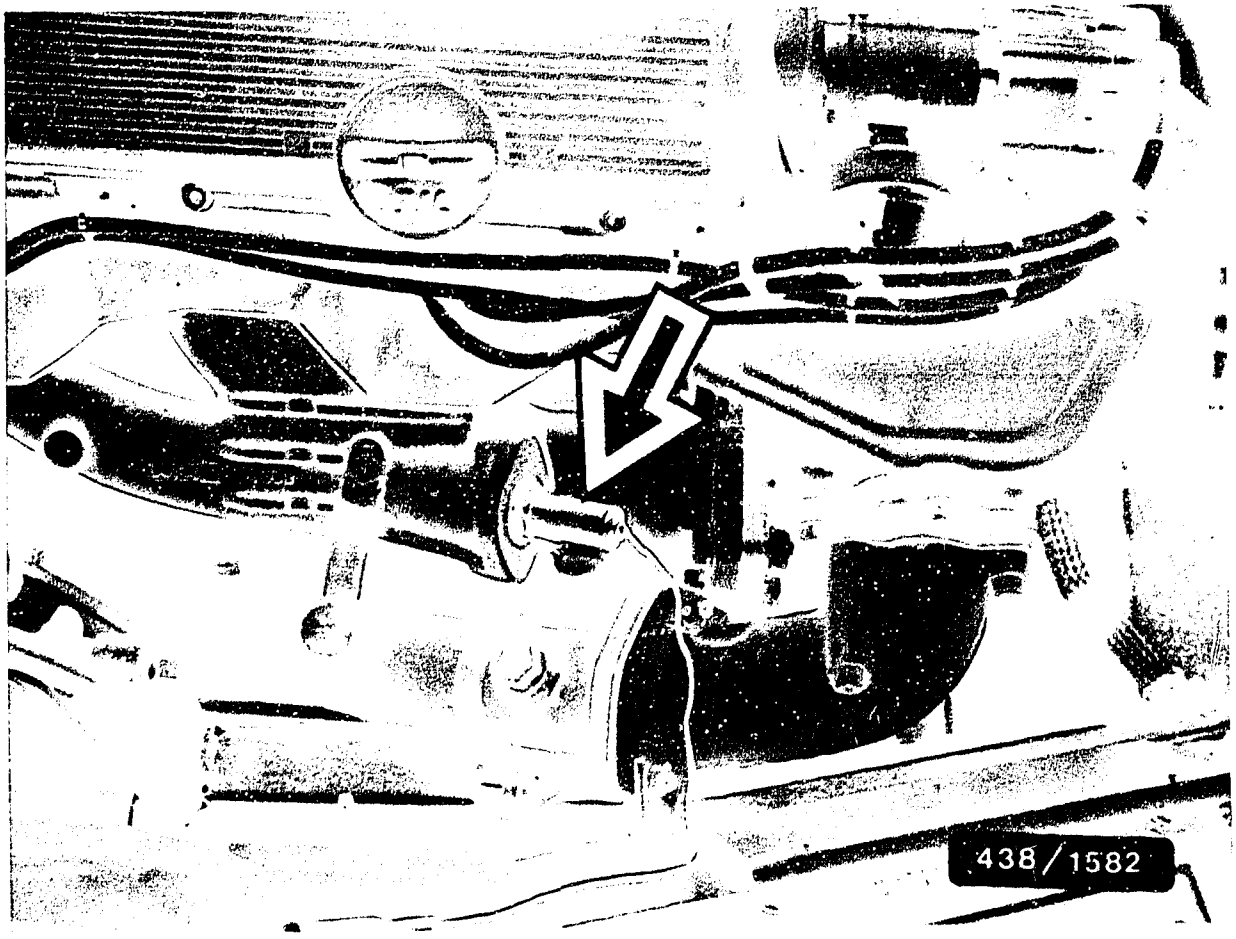


Throttle-valve switch for full-load enrichment. Switching point at 62° throttle-valve opening angle.

In vehicles as of the 1982 model with manually shifted transmission, a further microswitch, controlling the overrun fuel cut-off, is fitted on the carrying plate. Switching point as close as possible to 0° throttle-valve opening angle.



Timing valve, mounted on the left-hand side as viewed from the rear of the vehicle, in front of the mixture-control unit.

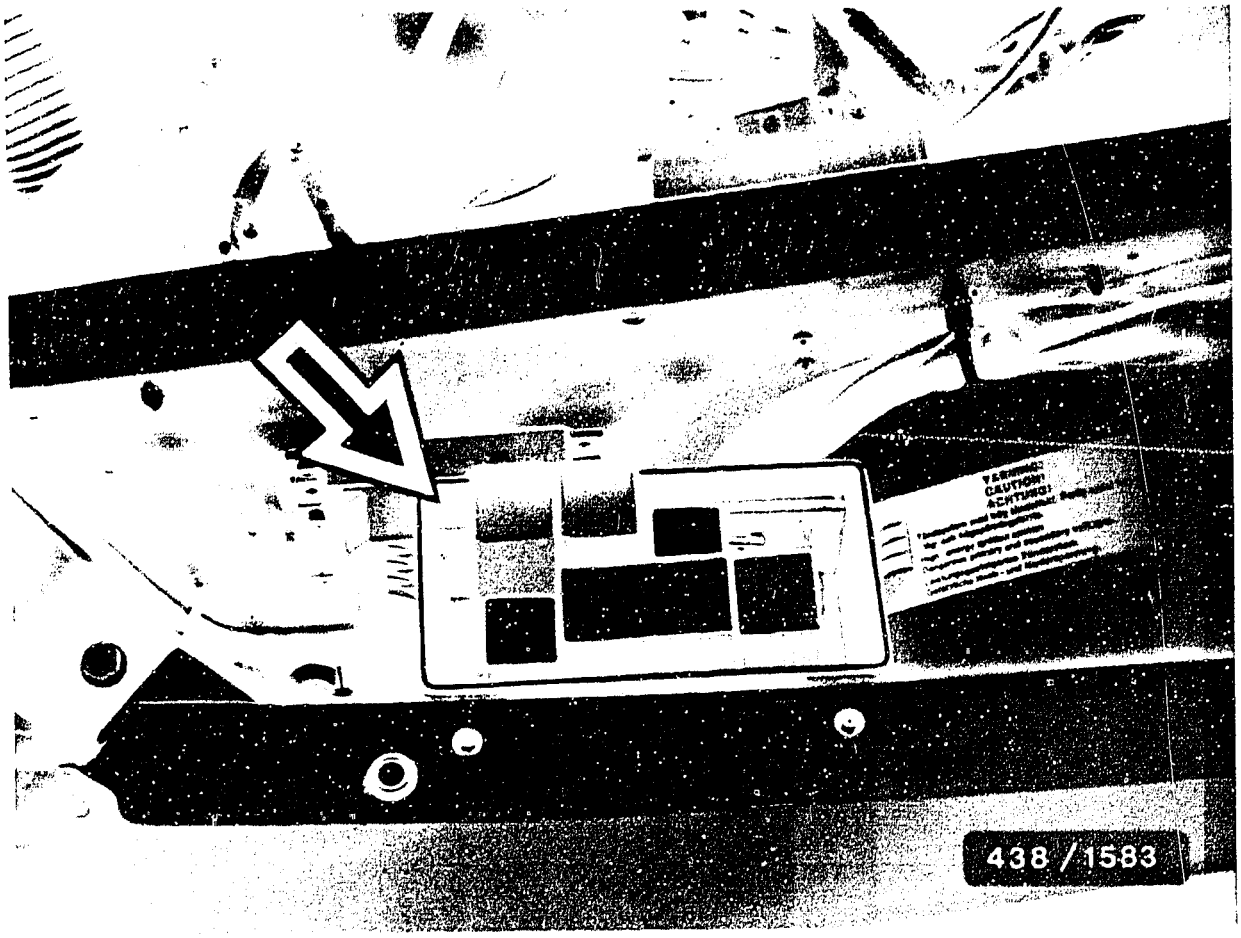


Lambda sensor, mounted in exhaust pipe between manifold and turbocharger.

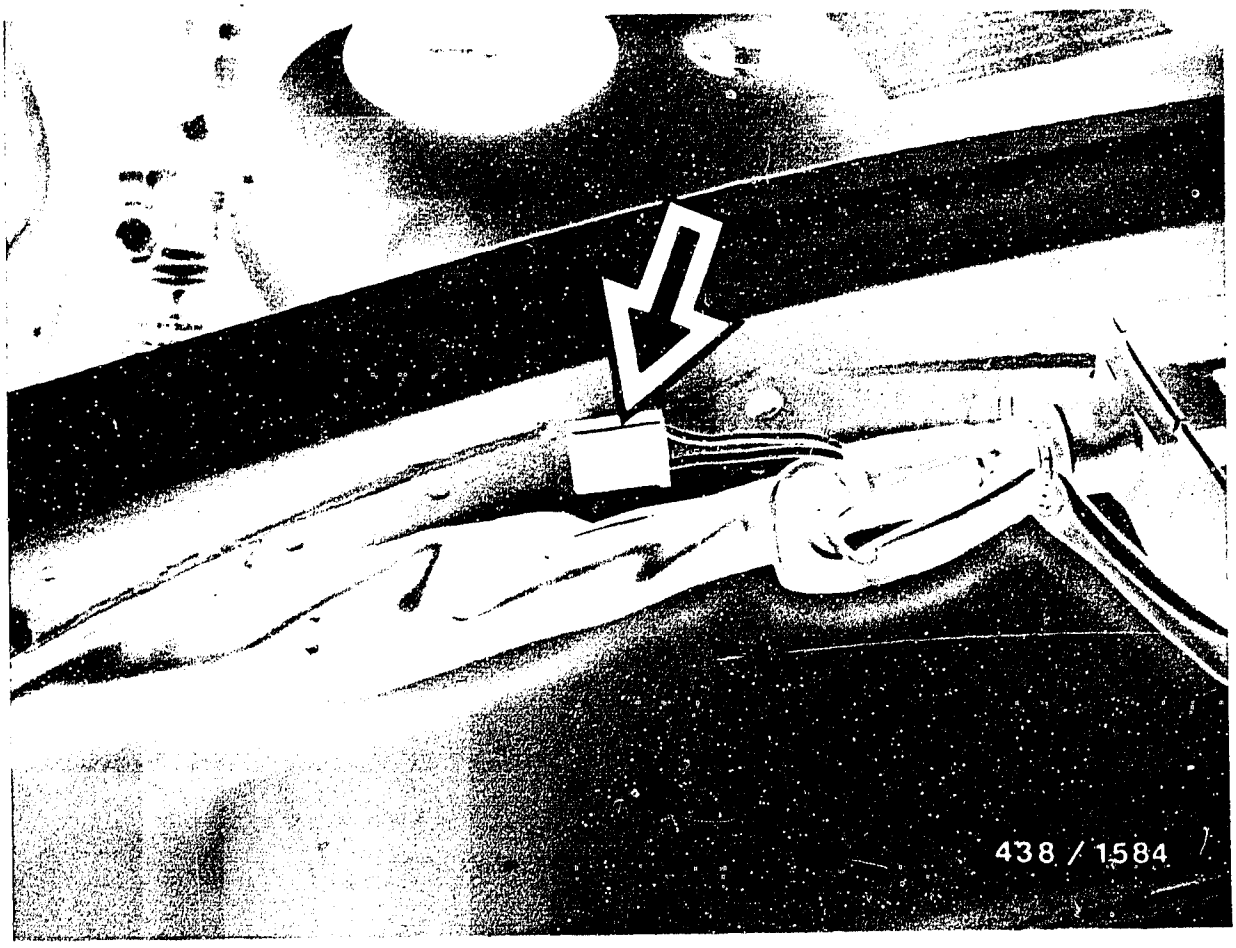
Leakage test on exhaust pipe, lambda sensor and manifold: force off exhaust system with compressed air and establish any leaks with leakage detector.

When replacing the sensor, apply special mounting paste VA 14016 Ft (5 964 080 105) to the thread of the sensor. Take care that only the threads are filled and no paste enters the slots.

If necessary, clean the plug connection of the sensor lead before disconnection. When plugging in, do not allow dirt to enter the plug and ensure that it latches home correctly.



The lambda relay and the various relays for the additional equipment in the USA models are located in a special console above the inner left-hand fender. See marking on cover for assignment of relays.



Test connection for the lambda closed-loop control tester KDJE-P 600 (arrow).

The blue lead of the tester must be connected to the transverse connector pin (with black supply lead).

21.7 Trouble-shooting program for lambda closed-loop control

Run engine until warm, switch off and allow to cool for approx. 3 minutes. Connect on/off meter (e.g. lambda closed-loop control tester KDJE-P 600 or motortester) to lambda measuring connection (contact 2, transverse).

Remove electric-fuel-pump relay in the central-electrics console and bridge contacts 30 and 87.

It must now be possible to hear and feel the timing valve working.

no →

Possible causes of trouble:

- Voltage supply to control unit interrupted (+ = pin 8, - = pin 5). Eliminate line interrupton if necessary.
- Control circuit to timing valve interrupted (+ from elec.-fuel-pump relay negative signal from control unit pin 15). Eliminate line interruption as necessary.
- Timing valve faulty (internal resistance nominal value 2...3Ω). Replace faulty timing valve.
- Control unit faulty. Replace control unit.

yes ↓

Continued on K3/K4

Trouble-shooting program for lambda closed-loop control (continued)

Supply relay remains bridged.

Disconnect plug connection in lambda-sensor lead (close to lambda sensor).
Indication of on/off ratio must correspond to t_1.

no →
- No indication or value too low: control unit faulty. Replace control unit.
- Indication of on/off ratio over 87%: sensor lead is short-circuited to ground. Eliminate short circuit (note: sensor lead has ground shield).

yes ↓

Supply line remains bridged.

Reconnect sensor lead. On/off ratio must still correspond to t_1.

no →
Indicated value over 87%:

Lambda sensor faulty (short circuit to ground). Replace lambda sensor.

yes ↓

Supply relay remains bridged.

Disconnect sensor lead again and hold cable connector (at control-unit end) to ground.

On/off ratio must rise to t_2.

no →
Possible causes:
- Sensor lead interrupted (to control unit, pin 2). Eliminate interrupt.
- Control unit faulty. Replace control unit.

yes ↓

Continued on K5/K6

Trouble-shooting program for lambda closed-loop control (continued)

Supply relay remains bridged.

Apply external voltage source, max. 2 V, to disconnected sensor lead at control-unit end.

Note: with lambda close-loop control tester KDJE-P 600, use special output "2 V". Otherwise 1.5 V single cell may be used.

On/off ratio must fall back to t_0.

no → Control unit faulty.

Replace control unit.

yes

Applies up to 1985 model only:

Supply relay remains bridged.

Manually actuate throttle-valve switch, full load.

On/off ratio must rise to t_3 (full-load enrichment)

no → Possible causes:

- Throttle-valve switch, full-load does not close. Test with ohmmeter. Replace faulty switch.
- Interruption in switch supply or lead to control unit, pin 7. Eliminate interruption.
- Control unit faulty. Replace control unit.

yes

Continued on K7/K8

Trouble-shooting program for lambda closed-loop control (continued)

Applies up to 1985 model only:

Insert relay for electric fuel pump in central-electrics console and start engine.

Increase engine speed to approx. 4000 min^{-1} and manually actuate throttle-valve switch, full load.

On/off ratio must rise to t_3; indication must be static (must not oscillate).

no → Engine speed relay for full-load enrichment faulty or interruption in control circuit.

Note: pin 87 of engine speed relay must be connected to ground for fulfilment of test condition.

Replace engine speed relay or eliminate interruption.

yes

Affects vehicles with manually shifted transmission only:

Disconnect plug connection of lambda-sensor lead.

Disconnet engine speed relay "Deceleration System Relay" (see cover marking) in the central-electrics console for lambda system and connect terminal X1 to ground.

On/off ratio must rise to t_4.

no → Test continuity of cable from relay base terminal X1 to control unit pin 12. Eliminate any interruption.

If no fault found: control unit faulty. Replace control unit.

yes

Continued on K9/K10

Trouble-shooting program for lambda closed-loop control (continued)

Start engine at normal operating temperature.

Increase speed to approx. 3000 min^{-1}, then close throttle valve (overrun cut-off). During period of falling engine speed, on/off ratio must rise to t_4.

no → Test continuity of all electrical connecting cables to engine speed relay, overrun cut-off acc. to electrical terminal diagram. Eliminate any interruption.

If no fault is found: engine speed relay faulty. Replace engine speed relay.

yes

Run engine at idle.

Disconnect plug connection of lambda-sensor lead.

Disconnect the time-lag relay "Transient Enrichment Relay" (see cover marking) in central-electrics console lambda system and in relay base connect terminal 11 to ground.

On/off ratio must rise to t_5.

no → Test continuity of cable from relay base, terminal 11 to control unit cable connector pin 11. Eliminate any interruption.

If no fault found: control unit faulty.
Replace control unit.

yes

Continued on K11/K12

Trouble-shooting program for lambda closed-loop control (continued)

Re-insert time-lag relay, reconnect the lambda sensor.

Start engine and at the same time observe indication of on/off ratio. During starting until max. 3 sec. afterwards, on/off ratio must rise to t_5.

Note: this function is independent of temperature.

no → Test continuity of all electrical connecting cables to time-lag relay acc. to terminal diagram. Eliminate any interruption.

If no fault found:
Time-lag relay faulty.
Replace time-lag relay.

yes

Start engine and accelerate. During acceleration, rise of on/off ratio to t_5.

Note: this function applies only if engine temperature is over approx. +30°C and only within 2 minutes following starting.

no → Test continuity of connecting cables of pressure-operated snap-action switch. Eliminate any interruption.

If no fault found:
Pressure-operated snap-action switch faulty. Replace pressure-operated snap-action switch.

yes

Continued on K13/K14

Trouble-shooting program for lambda closed-loop control (continued)

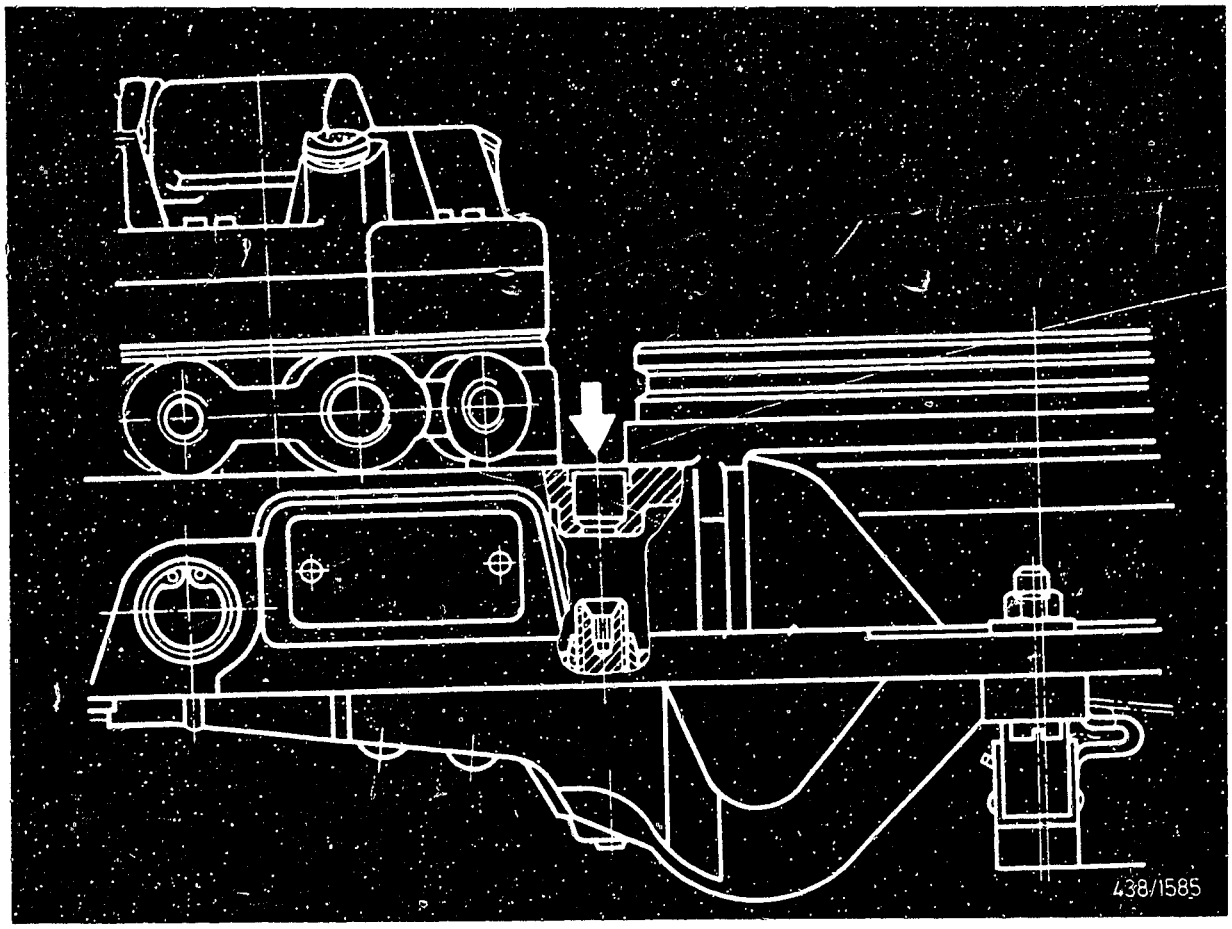
Start engine and run up to operating temperature again. Wait until closed-loop control system is active (oscillating reading).
The average indicated value should correspond to t_1, and the overall range of the oscillating reading should be approx. ± 7% of the average.

Deviation of the average value from t_1 is permissible on checking, but without reaching the limit values t_0 (lean stop) and t_2 (rich stop)

no → Adjustment as part of complete idle-speed adjustment acc. to Coordinate K16.

21.8 Lambda closed-loop control - on/off ratios

	Part no. of control unit 0280800035 (-> mod. 81)	0280800054 mod. 82/83	0280800070 mod.84 -->
t_0 (min.)	max. 20%	max. 20%	max. 20%
t_1 (control)	55 ... 65%	45 ... 55%	45 ... 55%
t_2 (max.)	min. 87%	min. 87%	min. 90%
t_3 (full load)	80 ... 90%	70 ... 80%	80 ... 90%
t_4 (oil temp.)	- -	55 ... 65%	55 ... 65%
t_5 (accel.)	- -	- -	min. 90%



21.9 Idle-speed adjustment

21.9.1 Anti-tamper dev. for idle-speed-adj. screw:

In the 81 model, the access bore to the idle-speed-adjustment screw must be sealed by an aluminium plug (arrow). Suggested tool set for removal of and pressing in aluminium plug: No. 4521/7 from Hazet Co., D-5630 Remscheid.

A steel plate is incorporated in the plug to prevent penetration when predrilling.

Part number of aluminium plug: 2 437 001 009.

In the models before and after 1981, the access bore is sealed with a rubber plug.

21.9.2 Idle-speed adjustment/adjustment of lambda closed-loop control:

Testing and correction of the idle-mixture setting is not carried out, as is usually the case, by measurement of the CO content in the exhaust gas (% by vol.), but rather by measurement of the on/off ratio of the lambda closed-loop control.

Precondition for testing: lambda closed-loop control in working order and operational, i.e. lambda sensor connected, engine at normal operating temperature, on/off-ratio meter connected. It must also be ensured that there are no leaks in the exhaust system as far as the catalytic converter.

Testing and adjustment:

Idle speed:

up to 1980 model:	825 ... 875 min^{-1}
as of 1981 model:	800 ... 950 min^{-1}

Inspection:

Run engine with idle speed set correctly. Wait until closed-loop control is active (oscillating on/off-ratio indication). The average value of the oscillating on/off-ratio indication should be t_1, and the overall range of the oscillating indication approx. $\pm$ 7%. Deviation of the average value from t_1 is permissible during inspection, but the limit values t_0 (lean stop) and t_2 (rich stop) must not be reached.

Adjustment:

(Generally only necessary after repair work.)
Adjust idle-mixture-adjusting screw such that the average value of the oscillating indication corresponds to the on/off ratio t_1.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor
Blue — securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor
Red — Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

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After-sales Service

Technical Bulletin

FUEL PUMPS 0 580 254 9..

with replaceable non-return valve

58
VDT-I-580/100 En
9.1978

On various new-model fuel pumps 0 580 254 9.., it is possible to replace the non-return valve. These pumps are recognisable by their light-metal housing and centrally arranged suction and pressure fittings. See also VDT-W-438/500.

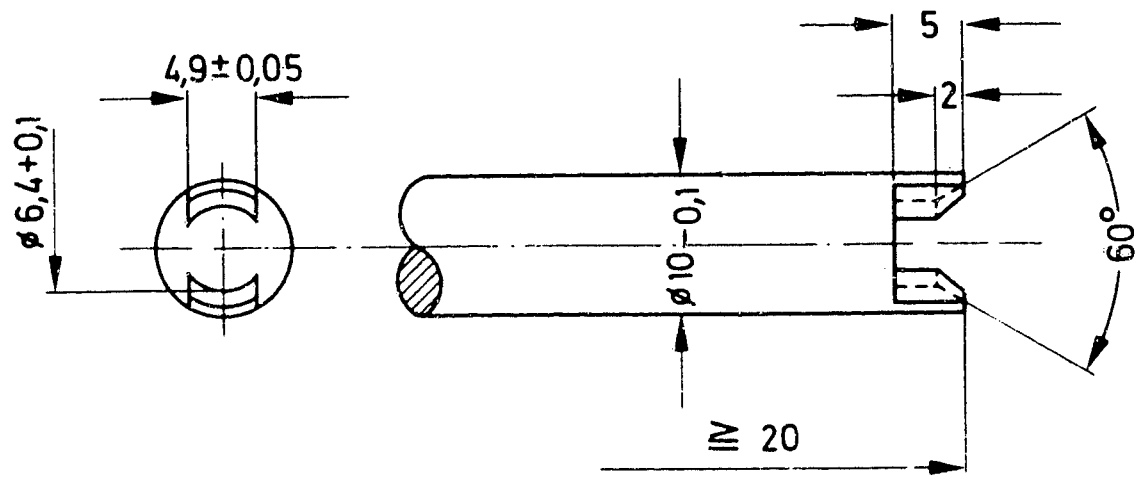
The non-return valve in question, together with the necessary O-ring, is available as a set under the part number 1 587 410 901.

Assembly

Clean the hose connection thoroughly at the pressure fitting and unscrew it.
Unscrew the non-return valve using a pin screwdriver (see Fig.).
Screw in the new non-return valve.
Do not over-tighten. Tightening torque of 0.4...0.6 Nm (4...6 kgf/cm) is to be adhered to.
The thread is plastic. The non-return valve is sealed with an O-ring.

Tool

Manufacture the pin-type screwdriver yourself according to the sketch. It can also be made from a conventional screwdriver with a 9...10 mm blade.



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After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

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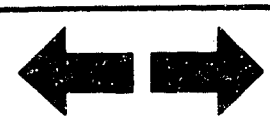

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